

INDIAN MARITIME UNIVERSITY
(A Central University, Govt. of India)

B.Tech.(Marine Engineering) - Semester V
December 2015 End Semester Examinations

Fluid Mechanics - II
Subject Code: UG11T2504/ UG11T1504

Time: 3 hrs
Date: 17.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)
Compulsory Questions

1. Compulsory short answer questions

- a. How is the choice of repeating variable made in case of Buckingham's method?
- b. List the dimensionless coefficients used in model testing of hydraulic turbines.
- c. Define operating point and shut off head of centrifugal pump.
- d. What are the advantages of installing air vessels in reciprocating pumps?
- e. Explain why backward curved blades are more popularly used.
- f. What is manometric head? How is it related to the internal losses of centrifugal pump?
- g. What is cavitation? When does it occur in reciprocating pump?
- h. Explain why the casing is of spiral shape with uniform change in area, in case of reaction turbines.
- i. Define speed ratio in case of turbines and pumps.
- j. State the difference between Pelton wheel and Francis turbines.

Part-B (5x14 = 70 Marks)
Answer any five of the followings.

2. A centrifugal pump lifts water against a static head of 40 m, of which 4 m is suction lift. The suction and delivery pipes are both 150mm diameter; the head loss in the suction pipe is 2.3 m and in the delivery pipe 7.4 m. The impeller is 420 mm diameter and 25mm wide at the mouth; it revolves at 1200 rpm and its effective valve angle at exit is 35 degree. If manometric efficiency is 82% and overall efficiency is 72 %; determine the discharge delivered by the pump and power required to drive the pump. Also find the pressure head indicated at the suction and delivery branches of the pump.
(14 Marks)
3. a) Derive an expression of specific speed of centrifugal pump.
b) Find the power required to drive a centrifugal pump which delivers 0.04 m³/sec of water to a height of 20 m through a 15 cm diameter and 100 m long pipe line. The overall efficiency of the pump is 70% and friction factor $f=0.06$ for the pipeline. Assume inlet losses in suction pipe equal to 0.33 m.
(4+10=14 Marks)
4. A Francis turbine works under a head of 120 m. The outer diameter and width are 2 m and 0.16 m. The inner diameter and width are 1.2 m and 0.27m. The flow of velocity at inlet is 8.1 m/sec. The whirl velocity at outlet is zero. The outlet blade angle is 16°. Assume hydraulic efficiency 90%. Determine (i) power developed, (ii) speed at inlet (iii) blade angle at inlet and (iv) guide blade angle at inlet.
(14 Marks)

5. A Pelton wheel has a mean bucket speed of 12 m/sec and is supplied with water at a rate of 750 litres per second under a head of 35 m. If the bucket deflects the jet through an angle of 160 degree, find the power developed by the turbine and its hydraulic efficiency. Take the co-efficient of velocity as 0.98. Neglect friction in the bucket. Also determine the overall efficiency of the turbine if its mechanical efficiency is 80%. (14 Marks)
6. A double acting reciprocating pump, running at 40 rpm, is discharging 1.0 m³ of water per minute. The pump has a stroke of 400 mm. The diameter of the piston is 200mm. The delivery and suction head are 20 m and 5 m respectively. Find the percentage of slip of the pump and power required to drive the pump. (14 Marks)
7. a) Draw a complete indicator diagram of single acting Reciprocating pump and mark on it the effect of acceleration and friction in suction and delivery pipes.
b) Derive the expression of rate of flow of liquid into and from the air vessel for single acting reciprocating pump and from that expression, find the crank angles at which there will be no flow into or from the air vessel. (4 + 10 – 14 Marks)
8. A pump running at 1450 rpm with impeller diameter of 20cm is geometrically similar to a pump with 30 cm impeller diameter running at 950 rpm. The discharge of the large pump at the maximum efficiency was 200 litres/sec at a total head of 25 m. Determine the discharge and the head of the smaller pump at the maximum efficiency conditions. Also determine the ratio of power required. (14 Marks)

INDIAN MARITIME UNIVERSITY
TERM – END EXAMINATION – DEC '11/JAN'12

Sub Code: UG/ME/MS/T/311

Sub Name: Material Science

Sem: V

Time: 0300Hrs

Max. Marks: 100

Part A (10 × 3 = 30 Marks)
Answer all the Questions

1.
 - a) State the different types of bonds and their characteristics.
 - b) What is unit cell and space lattice?
 - c) What are the classifications of steel? What is alloy steel?
 - d) What is NDT? What are the common methods used in NDT?
 - e) Define solid solution and name the types of solid solution?
 - f) Define the phase diagram and what are the types of phase diagram?
 - g) Write some objectives of heat treatment?
 - h) What are factors affecting the fatigue?
 - i) State the properties and uses of titanium?
 - j) Name the materials used in Boiler, Propeller and Rudder?

Part B (5 × 14 = 70 Marks)
Answer any five of the following

2.
 - a) Explain with neat sketch of B.C.C, F.C.C and H.C.P. (7 MARKS)
 - b) Describe in detail about covalent bond and metallic bond. (7 MARKS)
3. State the properties and uses of Grey cast iron, white cast iron, malleable cast iron, chilled cast iron, spheroidal cast iron, alloy cast iron and meehanite cast iron? (14MARKS)
4. Draw and explain iron carbide equilibrium diagram and mark on it all salient temperature and composition fields? (14MARKS)
5. Compare and contrast the process of stress relief annealing, process annealing, spheroidise annealing and full annealing. (14 MARKS)
6.
 - a) Explain the mechanism of fatigue fracture (7 MARKS)
 - b) What is creep? With neat sketch explain about various stages of creep. (7 MARKS)

7. Briefly discuss common types of corrosion that are encountered on metal in different situation. (14MARKS)
8. a) Write short notes on PTFE? What are the properties and application of it? (8 MARKS)
- b) Write the application of ceramic materials? (6 MARKS)

4-24

5-23

7-36

104-24

105-24

107-36

109-25+1

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering) - Semester – V
December 2015 - End Semester Examinations

Marine Internal Combustion Engine - I
Subject Code: UG11T1503/UG11T2503

Time: 3 Hours
Date: 14.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)

Compulsory Questions

- 1) (a) Define mean piston speed and list down the constraints for increasing the mean piston speed.
(b) Explain compression ratio, pressure ratio and cutoff ratio for the dual cycle engines.
(c) Compare tie rods and holding down bolts for Marine IC engines
(d) Describe the various power ratings of the engine
(e) Explain the relationship between heat balance and thermal efficiency of the engine
(f) Explain how supercharging helps to improve the combustion efficiency and reducing specific fuel oil consumption
(g) What is CCAI in relationship with ignition quality of fuel
(h) Describe the reasons why jacket cooling water to be treated onboard
(i) Compare briefly electronically controlled engines with conventional marine diesel Engines
(j) Write down the measures to control NOX and SOX.

Part-B (5x14 = 70Marks)

Answer any five of the followings.

- 2) a) Explain the 4-stroke engine valve timing diagram with the help of crank angle diagram. (5 Marks)
b) State the objectives of valve timing. (3 Marks)
c) What is meant by scavenge efficiency? (3 Marks)
d) Discuss the effect of the shape of the ports and choking with carbon deposits on scavenge efficiency. (3 Marks)
- 3) (a) Describe, with the aid of a sketch, the operation of main engine exhaust valve which is hydraulically operated. (10 marks)
(b) In a diesel engine late injection is indicated by black or grey exhaust smoke with low exhaust temperature, justify your answer (4 marks)
- 4) (a) Sketch and describe a large turbocharger for the Marine Diesel Engines. (7 Marks)
(b) Give reasons for the relative positions of the various components shown. (7 Marks)

- 5) (a) Sketch and describe a fuel oil system of a large diesel engine, from a settling tank to main engine fuel injectors. (8 Marks)
- (b) Comment on the importance of:
- (i) Heating arrangement with temperature control. (2 Marks)
 - (ii) Prevention of air lock in the system. (2 Marks)
 - (iii) Purification of fuel. (2 Marks)
- 6) With reference to large slow-speed diesel engines discuss with reasons, the following
- (a) The increasing use of long-stroke crosshead engines. (7 Marks)
 - (b) The introduction of two-stage turbocharging. (7 Marks)
- 7) a) Draw a neat sketch of cylinder liner of large marine 2 stroke diesel engine of any reputed manufacturer where bore cooling method is used. (8 Marks)
- b) Label the sketch and briefly describe the special features of Liner. (6 Marks)
- 8) a) Describe how a crankcase explosion may occur and state the possible causes. (3 Marks)
- b) What safeguards may be used to reduce the risk of this occurring or of reducing subsequent damage? (8 Marks)
- c) List the procedures, which should be taken if such conditions occur. (3 marks)

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering) - Semester – V
December 2015 - End Semester Examinations

Marine Internal Combustion Engine - I
Subject Code: UG11T1503/UG11T2503

Time: 3 Hours
Date: 14.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)

Compulsory Questions

- 1)
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 - (g) What is CCAI in relationship with ignition quality of fuel
 - (h) Describe the reasons why jacket cooling water to be treated onboard
 - (i) Compare briefly electronically controlled engines with conventional marine diesel Engines
 - (j) Write down the measures to control NOX and SOX.

Part-B (5x14 = 70Marks)

Answer any five of the followings.

- 2)
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 - b) State the objectives of valve timing. (3 Marks)
 - c) What is meant by scavenge efficiency? (3 Marks)
 - d) Discuss the effect of the shape of the ports and choking with carbon deposits on scavenge efficiency. (3 Marks)
- 3)
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 - (b) In a diesel engine late injection is indicated by black or grey exhaust smoke with low exhaust temperature, justify your answer (4 marks)
- 4)
 - (a) Sketch and describe a large turbocharger for the Marine Diesel Engines. (7 Marks)
 - (b) Give reasons for the relative positions of the various components shown. (7 Marks)

- 5) (a) Sketch and describe a fuel oil system of a large diesel engine, from a settling tank to main engine fuel injectors. (8 Marks)
- (b) Comment on the importance of:
- (i) Heating arrangement with temperature control. (2 Marks)
 - (ii) Prevention of air lock in the system. (2 Marks)
 - (iii) Purification of fuel. (2 Marks)
- 6) With reference to large slow-speed diesel engines discuss with reasons, the following
- (a) The increasing use of long-stroke crosshead engines. (7 Marks)
 - (b) The introduction of two-stage turbocharging. (7 Marks)
- 7) a) Draw a neat sketch of cylinder liner of large marine 2 stroke diesel engine of any reputed manufacturer where bore cooling method is used. (8 Marks)
- b) Label the sketch and briefly describe the special features of Liner. (6 Marks)
- 8) a) Describe how a crankcase explosion may occur and state the possible causes. (3 Marks)
- b) What safeguards may be used to reduce the risk of this occurring or of reducing subsequent damage? (8 Marks)
- c) List the procedures, which should be taken if such conditions occur. (3 marks)

INDIAN MARITIME UNIVERSITY
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May/June 2017 End Semester Examinations
B. Tech (Marine Engineering – Fifth Semester)

Marine Internal Combustion Engine – I
UG11T 2503/UG11T 1503

Date: 03.07.2017

Maximum Marks : 100

Time: 3 Hrs

Pass Marks : 50

PART – A

10X3=30 Marks

(All questions are compulsory)


1. (a) Define Mean Piston Speed and List down the constraints for increasing it.
- (b) What is the purpose of Tie Bolts in a large 2 stroke Diesel Engine?
- (c) Why 2 stroke Cross Head Engine is fitted with Guide Shoe?
- (d) Name the various types of scavenging in a 2 Stroke Diesel Engine?
- (e) What is Super Charging of Diesel Engines?
- (f) What is the minimum compression ratio required in a Diesel Engine and why?
- (g) Name the various cooling medium used for cooling the different parts of a Marine Diesel Engine.
- (h) Name the various grades of fuel oil used for Marine Diesel Engines.
- (i) Explain how a primary explosion in a crank case can trigger a secondary explosion.
- (j) What are the implication of Stroke – Bore Ratio in Diesel Engines.

PART – B

5X14=70 Marks

(Answer any 5 of the following)

2. (a) Draw and Explain a 4 Stroke Diesel Engine Valve Timing Diagram (crank angle diagram) with respect to Indicator Diagram (PV diagram). (10 Marks)
- (b) State and Explain different Power Ratings used to distinguish Diesel Engines. (4 Marks)

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3. (a) Explain the working of a Hydraulically Operated Main Engine Exhaust Valve with a simple diagram (PV diagram). (10 Marks)
- (b) Explain the differences between Pulse and Constant Pressure Turbo charging system? (4 Marks)
4. (a) Explain the Turbocharger of Large 2 stroke Diesel Engine with a simple diagram. (10 Marks)
- (b) What is the purpose of the Labyrinth Seal in a T/C. (4 Marks)
5. (a) Sketch and describe a Fuel Oil System of a Large Marine Diesel Engine, from Settling Tank to Main Engine Fuel Injectors. (10 Marks)
- (b) Explain Ignition Delay and After Burning in a Marine Diesel Engine. (4 Marks)
6. (a) Explain the various means of reducing SO_x emission from Marine Diesel Engines. (7 Marks)
- (b) Explain the various means of reducing NO_x emission from Marine Diesel Engines. (7 Marks)
7. (a) Draw a neat sketch of a Cylinder Liner of a Large 2 Stroke Marine Diesel Engine where bore cooling method is used. (10 Marks)
- (b) Explain why Chemical Treatment of Main Engine Jacket Cooling Water is necessary? (4 Marks)
8. (a) Explain how Starting Air Line Explosion can take place in a Large Marine Diesel Engine. (4 Marks)
- (b) What are the Safety Devices fitted to prevent a Starting Air Line Explosion? Explain the operating principle of each device. (10 Marks)

INDIAN MARITIME UNIVERSITY
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B.Tech (Marine Engineering) - Semester V
December 2015 End Semester Examinations

Marine Auxiliary Machines - I
Subject Code:UG11T2505/UG11T1505

Time: 3 hrs
Date: 21.12.2015

Max Marks-100
Pass Marks-50

Part-A (10x3=30 Marks)

Compulsory Question

- 1) (a) Name Five Machineries placed in E/R bottom platform and its purposes.
- (b) What is bunker delivery note? Who issues to whom and why?
- (c) Illustrate the differences between a strainer and filter.
- (d) How to increase the oil retention time in purifier and its effects?
- (e) State the safety fittings on main air bottle with its respective purpose.
- (f) How thermal expansion of tubular heat exchanger's tube stack is taken care?
- (g) Why E/R ventilation system is required on ship and how it is done?
- (h) What is rudder drop and jumping clearance?
- (i) Name different types of dry docking and explain the purposes of dry docking a ship.
- (j) What is MARPOL convention and its application on board?

Part B (5x14=70 Marks)

Answer any five of the following.
All questions carry equal marks.

- 2) What is double acting positive displacement pump?
Sketch and label an E/R bilge line of a sea going ship. Which type of line valve s are used in the system and why?
- 3) How to start Main air compressor manually on board? Explain the safety devices fitted on compressor and in its system with respective objective
- 4) What is viscosity of oil and its dimension? How does it maintain in main engine fuel system? Draw a fuel supply system for a long two stroke engine and explain.

- 5) What are the advantages of a plate type cooler over a shell & tube type cooler? Explain how the plates are cleaned and assemble up.
- 6) a) How a gravity disc size of a purifier is defined? What is over flow of oil in purifier and the reasons of it?
b) How drive electrical motor power is transmitted to purifier vertical shaft? Explain with diagram.
- 7) What is the purpose of a steering gear? Explain Rotary vane steering gear system with a diagram. What is non follow up control system of steering gear and when it is use?
- 8) a) What is main engine crank shaft deflection? How this deflection is measured and its use?
b) What is intermediate shaft in marine propulsion? Why this shaft is provided? Explain how does this shaft is supported with its lubrication system.

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INDIAN MARITIME UNIVERSITY
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MARINE INTERNAL COMBUSTION ENGINE I
SEMESTER – V, B.TECH(MARINE ENGINEERING): DEC/JAN 2013-14
SUBJECT CODE: T 1503
(AY 2009-10 to 2012-13 batches only)

Date: 18.12.2013

Time: 3 Hrs
Maximum Marks:100
(Weightage 70%)

- Note : i) Use of Non programmable scientific calculator is allowed.
ii) Attempt six questions
iii) Question in SECTION- A is compulsory.

SECTION - A

Question No. 1 is compulsory

10 x 3 = 30 M

1. a) Draw timing diagram of a 2-Stroke Diesel Engine and name the processes of the complete cycle.
- b) Briefly explain the terms : Mean Piston speed, M.C.R and Ignition delay .
- c) Why tie rods are used for diesel engines ?
- d) Name various types of scavenging system used for Marine Diesel Engine name the best type with justification.
- e) What are the various impurities generally found in Heavy Fuel oil used in large 2-stroke Diesel Engine. ?
- f) What are the various methods used for control of NOx in diesel engine .
- g) Justify the cooling medium you would use for cooling of 2-stroke X-hdtype piston.
- h) Explain briefly , how severity of crankcase explosion in diesel engine is reduced.
- i) Briefly explain heat treatment methods used for Crankshaft.
- j) Prepare a list of factors that influence combustion in diesel engine .

SECTION - B

Answer any five from the following:

(5 x 14 = 70)

2. a) Why is it difficult to lubricate X-hd bearing of a diesel engine .
b) Explain at least two methods which are in use to overcome this problem
(4 + 5 + 5)
3. a) Draw a neat sketch of Cylinder Liner of large 2-Stroke Marine Diesel Engine of any reputed manufacturer where bore cooling method is used. Label the sketch and brief describe including the special features of the liner.
b) Show all sealing areas on the liner and explain the sealing method & material.
c) What is the quality of finish provided to the liner surface and how is it achieved ?
(8 + 3 + 3)

PART B

Answer any five questions.

- 2) Draw a combustion characteristic curve of a slow speed diesel engine and explain the curve. (4+10 Marks)
- 3) The Gudgeon bearing assembly is not particularly suited for highly rated two stroke engine unless special arrangements are made for its lubrication. (14 Marks).
- 4) Draw a simple line sketch diagram of static components of a cross head type diesel engine. Show how all those components are fastened. Label all the components. (8+4+2 Marks)
- 5) Sketch and describe a constant pressure turbo charging system. Give its advantages and disadvantages. What is the maintenance required to maintain its efficiency? (4+4+6 Marks).
- 6) Discuss each of the following terms and explain its relevance to internal combustion engine.
a) After burning of fuel in combustion chamber. b) Compression ratio in diesel engine. (3.5x4 Marks)
c) Fuel oil ignition delay. d) Labyrinth seal.
- 7) Sketch a simple line diagram for a main engine Jacket cooling water system with auto temperature control. Explain the maintenance required for a cooling unit. (10+4 Marks)
- 8) Define the causes of cylinder liner and piston rings wear? What maintenance needs to be carried out to avoid the wear out? Explain the possible consequences of operating a main engine with excessive wear. (4+4+6 Marks)
- 9) List the various factors which lead to Main engine start air line explosion. What are the indications prior to the explosion?
What are the safety features incorporated in the system to avoid explosion. (4+4+6 Marks)

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering) - Semester – V
December 2015 - End Semester Examinations

Marine Internal Combustion Engine - I
Subject Code: UG11T1503/UG11T2503

Time: 3 Hours
Date: 14.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)

Compulsory Questions

- 1) (a) Define mean piston speed and list down the constraints for increasing the mean piston speed.
(b) Explain compression ratio, pressure ratio and cutoff ratio for the dual cycle engines.
(c) Compare tie rods and holding down bolts for Marine IC engines
(d) Describe the various power ratings of the engine
(e) Explain the relationship between heat balance and thermal efficiency of the engine
(f) Explain how supercharging helps to improve the combustion efficiency and reducing specific fuel oil consumption
(g) What is CCAI in relationship with ignition quality of fuel
(h) Describe the reasons why jacket cooling water to be treated onboard
(i) Compare briefly electronically controlled engines with conventional marine diesel Engines
(j) Write down the measures to control NOX and SOX.

Part-B (5x14 = 70Marks)

Answer any five of the followings.

- 2) a) Explain the 4-stroke engine valve timing diagram with the help of crank angle diagram. (5 Marks)
b) State the objectives of valve timing. (3 Marks)
c) What is meant by scavenge efficiency? (3 Marks)
d) Discuss the effect of the shape of the ports and choking with carbon deposits on scavenge efficiency. (3 Marks)
- 3) (a) Describe, with the aid of a sketch, the operation of main engine exhaust valve which is hydraulically operated. (10 marks)
(b) In a diesel engine late injection is indicated by black or grey exhaust smoke with low exhaust temperature, justify your answer (4 marks)
- 4) (a) Sketch and describe a large turbocharger for the Marine Diesel Engines. (7 Marks)
(b) Give reasons for the relative positions of the various components shown. (7 Marks)

- 5) (a) Sketch and describe a fuel oil system of a large diesel engine, from a settling tank to main engine fuel injectors. (8 Marks)
- (b) Comment on the importance of:
- (i) Heating arrangement with temperature control. (2 Marks)
 - (ii) Prevention of air lock in the system. (2 Marks)
 - (iii) Purification of fuel. (2 Marks)
- 6) With reference to large slow-speed diesel engines discuss with reasons, the following
- (a) The increasing use of long-stroke crosshead engines. (7 Marks)
 - (b) The introduction of two-stage turbocharging. (7 Marks)
- 7) a) Draw a neat sketch of cylinder liner of large marine 2 stroke diesel engine of any reputed manufacturer where bore cooling method is used. (8 Marks)
- b) Label the sketch and briefly describe the special features of Liner. (6 Marks)
- 8) a) Describe how a crankcase explosion may occur and state the possible causes. (3 Marks)
- b) What safeguards may be used to reduce the risk of this occurring or of reducing subsequent damage? (8 Marks)
- c) List the procedures, which should be taken if such conditions occur. (3 marks)

INDIAN MARITIME UNIVERSITY
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December 2016 End Semester Examinations
B.Tech. (Marine Engineering) Fifth Semester

Material Science (UG11T1501/ UG11T2501)

Date : 15.12.2016

Time: 3 Hrs

Maximum Marks: 100

Pass Marks : 50

PART -A
(Compulsory Question)

(3 x 10 = 30 Marks)

1. a) What is the basic difference between cast iron and steel ?
- b) With respect to phase diagram explain what do you understand by eutectic reaction and eutectoid reaction ?
- c) Define Fatigue
- d) State Gibb's phase rule
- e) What are the objectives of heat treatment ?
- f) Give any five destructive tests for material
- g) Explain the pilling Bedworth rule with suitable example
- h) What is S-N curve ? What can we get from the curve?
- i) Briefly give the effects of following elements on Steel, Carbon, Sulphur and phosphorous
- J) Write short notes on "Principal Quantum No" & "Azimuthal Quantum No"

PART - B
(Answer any five)

(5 x 14= 70 Marks)

2. a) Define the term Creep. Explain the various types of creep with suitable diagram. (8)
- b) Explain the fatigue testing machine with suitable diagram (6)
3. Discuss the materials to be selected for manufacture of the following components and also discuss the desirable properties of those components (14)
 - a) Engine Crankshaft
 - b) Diesel Engine Cylinder Liner
 - c) Diesel Engine piston Crown
 - d) Diesel Engine Cylinder Cover
4. Show the phase diagrams of an alloy consisting of "A" And "B" when "A" And "B" are (14)
 - a) Soluble in liquid state and solid state
 - b) Soluble in liquid state but completely insoluble in solid state
 - c) Soluble in liquid state but partly soluble in solid state
5. a) What is "Ultimate Tensile Strength" of a material ? (2)
- b) Describe in detail, the procedure of measuring tensile strength of a material (12)

6. What are the various means of arresting corrosion of material? Discuss each of them briefly (14)
7. Describe the different methods to increase the surface hardness of different steel product (14)
8. Write short note on (i) Insulating material (ii) Plastic (iii) Elastomers (iv) Metallic Bonding (14)

INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

May/June 2017 End Semester Examinations

B. Tech (Marine Engineering – Fifth Semester)

Marine Internal Combustion Engine – I

UG11T 2503/UG11T 1503

Date: 03.07.2017

Maximum Marks : 100

Time: 3 Hrs

Pass Marks : 50

PART – A

10X3=30 Marks

(All questions are compulsory)

1. (a) Define Mean Piston Speed and List down the constraints for increasing it.
- (b) What is the purpose of Tie Bolts in a large 2 stroke Diesel Engine?
- (c) Why 2 stroke Cross Head Engine is fitted with Guide Shoe?
- (d) Name the various types of scavenging in a 2 Stroke Diesel Engine?
- (e) What is Super Charging of Diesel Engines?
- (f) What is the minimum compression ratio required in a Diesel Engine and why?
- (g) Name the various cooling medium used for cooling the different parts of a Marine Diesel Engine.
- (h) Name the various grades of fuel oil used for Marine Diesel Engines.
- (i) Explain how a primary explosion in a crank case can trigger a secondary explosion.
- (j) What are the implication of Stroke – Bore Ratio in Diesel Engines.

PART – B

5X14=70 Marks

(Answer any 5 of the following)

2. (a) Draw and Explain a 4 Stroke Diesel Engine Valve Timing Diagram (crank angle diagram) with respect to Indicator Diagram (PV diagram). (10 Marks)
- (b) State and Explain different Power Ratings used to distinguish Diesel Engines. (4 Marks)

3. (a) Explain the working of a Hydraulically Operated Main Engine Exhaust Valve with a simple diagram (PV diagram). (10 Marks)
- (b) Explain the differences between Pulse and Constant Pressure Turbo charging system? (4 Marks)
4. (a) Explain the Turbocharger of Large 2 stroke Diesel Engine with a simple diagram. (10 Marks)
- (b) What is the purpose of the Labyrinth Seal in a T/C. (4 Marks)
5. (a) Sketch and describe a Fuel Oil System of a Large Marine Diesel Engine, from Settling Tank to Main Engine Fuel Injectors. (10 Marks)
- (b) Explain Ignition Delay and After Burning in a Marine Diesel Engine. (4 Marks)
6. (a) Explain the various means of reducing SO_x emission from Marine Diesel Engines. (7 Marks)
- (b) Explain the various means of reducing NO_x emission from Marine Diesel Engines. (7 Marks)
7. (a) Draw a neat sketch of a Cylinder Liner of a Large 2 Stroke Marine Diesel Engine where bore cooling method is used. (10 Marks)
- (b) Explain why Chemical Treatment of Main Engine Jacket Cooling Water is necessary? (4 Marks)
8. (a) Explain how Starting Air Line Explosion can take place in a Large Marine Diesel Engine. (4 Marks)
- (b) What are the Safety Devices fitted to prevent a Starting Air Line Explosion? Explain the operating principle of each device. (10 Marks)

INDIAN MARITIME UNIVERSITY
DEPARTMENT OF MARINE ENGINEERING
SEMESTER IV – JULY 2012 EXAMINATION

T/225 FLUID MECHANICS – I

TIME 3 HRS

MAX MARKS: 100

PART-A

(Marks 3 x10=30)

(Compulsory Question)

- 1.
- (a) Define the following non-dimensional numbers:
i) Reynold's Number, ii) Froude's Number and iii) Mach's Number.
 - (b) Explain the different conditions of equilibrium of a floating body.
 - (c) Distinguish between manometers and mechanical gauges. What are the different types of Mechanical pressure gauges?
 - (d) Define the following co-efficient : i) Co-efficient of velocity, ii) Co-efficient of contraction and iii) Co-efficient of discharge.
 - (e) Where and why the following devices are used : i) Pitot tube ii) Venturimeter iii) Orifice meter.
 - (f) Explain the terms: i) Pipes in parallel, ii) Pipes in series and iii) Equivalent pipe.
 - (g) Derive an expression for the loss of head due to sudden enlargement of pipe diameter.
 - (h) State and explain Hagen-Poiseuille equation.
 - (i) Draw the sketch of i) velocity distribution and ii) shear stress distribution across a section of a pipe when the flow is viscous.
 - (j) In case of forced vortex flow, explain the pattern of top surface with equation.

PART-B

(Total marks 14x5=70)

(Answer any five of the following)

2. a) With the help of Dimensional analysis, obtain the expression for Reynolds Number.
b) The frictional torque T of a disc of diameter D rotating at speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by
$$T = D^5 N^2 P \phi(\mu / D^2 N \rho)$$

Prove this by Buckingham pi theorem. (6+8)
2. a) A tank contains water upto a height of 0.5 m above the base. An immiscible liquid of sp. gr. 0.8 is filled on the top of water upto 1m height. Calculate
i) total pressure on one side of the tank.
ii) the position of centre of pressure for one side of the tank, which is 2m wide.
- b) A solid cylinder of diameter 4.0 m has a height of 4.0 m. Find the meta-centric height of the cylinder if the specific gravity of the material of cylinder is 0.6 and it is floating in water with its axis vertical. State whether the equilibrium is stable or unstable. (8+6)
3. a) Obtain the components of the force exerted by a Jet on stationary inclined flat plate in the direction of flow and also in the direction perpendicular to flow.

- b) A jet of water of diameter 7.5 cm moving with a velocity of 25 m/sec strikes a fixed plate in such a way that the angle between the jet and the plate is 60° . Find the force exerted by the jet on the plate i) in the direction normal to the plate and ii) in the direction of the jet. (6+8)
4. a) A pipe of diameter 300 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipe is 500m. Find the maximum power available at the outlet of the pipe, if the value of co-efficient of friction is 0.006.
- b) Two reservoirs A and B are connected by a pipe 60 cm diameter and 300 m long whose friction factor is 0.03. The surface areas of A and B are 9000 and 4500 m² respectively. Find the time taken to lower the level of the upper reservoir by 60 cm if the original difference of levels was 6 m. Assume constant areas and neglect losses other than pipe friction. (7+8)
5. a) Deduce an expression for the power absorbed in overcoming viscous resistance of a Collar Bearing.
- b) The external and internal diameters of a collar bearing are 20 cm and 15 cm respectively. Between the collar surface and the bearings, an oil film of thickness 0.025 cm and of Viscosity 0.9 poise is maintained. Find the torque and the H.P. lost in overcoming the viscous resistance of the oil when the shaft is running at 250 rpm. (6+8=14)
6. An open circular cylinder of 15 cm diameter and 100 cm long contains water upto a height of 70cm. When the cylinder is rotated about its vertical axis at 59.05 rad/sec, the vertical depth of water at centre becomes zero. Find the difference in total pressure force
i) at the bottom of cylinder and ii) at the sides of the cylinder due to rotation. (14)
7. a) Determine the hydraulic co-efficients - Cd, Cv, Cc by experimental method.
- b) A cylindrical tank is having a hemispherical base. The height of cylindrical portion is 5 m and diameter is 4 m. At the bottom of this tank an orifice of diameter 200 mm is fitted. Find the time required to completely emptying the tank. Assume Cd=0.6.

(6+8)

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering) - Semester V
December 2015 End Semester Examinations

Marine Auxiliary Machines - II

Subject Code: UG11T1604

Time: 3 hrs

Date: 18.12.2015

Max Marks: 100

Pass Marks: 50

Part-A

(10 x 3 Marks=30 Marks)

Compulsory Question

1. (a) Name the different refrigeration methods.
- (b) Name the components in a vapour compression refrigeration system?
- (c) How purging of air from a refrigeration system is carried out?
- (d) Why secondary refrigerant is used in cargo holds refrigeration system?
- (e) What are the properties of air that are altered / modified by an air conditioning system?
- (f) What is Noise? How is noise expressed?
- (g) What is meant by Critical Speed or Bared Range in a Marine Diesel Engine?
- (h) What is Residual Fuel Oil (or) Heavy Fuel Oil?
- (i) What is Elastohydrodynamic lubrication?
- (j) Name some of the desirable properties / characteristics of a good lubricant

Part-B

(5x14 Marks=70 Marks)

Answer any FIVE of the following

2. (a) Sketch and describe the working of a refrigeration system, with automatic controls, used for maintaining the temperature of different provision rooms carrying food stuffs / provisions for crew members. (10 Marks)
- (b) What are the desirable properties of a good refrigerant (4 Marks)

3. (a) Explain the functions of the following safety devices fitted on a refrigeration system:
- i. High Pressure [HP] Cut Out
 - ii. Relief Valves
 - iii. Oil Differential Cut Out
 - iv. Low Pressure [LP] Cut Off
- (8 Marks)
- (b) Give the causes for the following troubles in a refrigeration system:
- i. Compressor short cycles on low pressure control
 - ii. Discharge pressure too high
 - iii. Suction pressure too high & compressor crankcase sweating
- (6 Marks)
4. (a) Draw & explain the brine system for refrigerated cargo holds
- (8 Marks)
- (b) Explain the terms: micro-organisms, dead cargo & live cargo w.r.t. refrigerated cargo.
- (6 Marks)
5. (a) Describe an single duct air condition system with a simple sketch
- (8 Marks)
- (b) Discuss the design considerations of the ventilation system for
- i) Battery room
 - ii) CO₂ room
- (6 Marks)
6. (a) What are the sources of noise in a ship and describe the techniques to suppress it?
- (6 Marks)
- (b) What are the various modes of vibration in a ship? What are the sources of vibrations and describe the techniques to suppress it?
- (8 Marks)
7. (a) Explain the treatment of fuel carried out for its effective combustion in Marine I.C Engines
- (8 Marks)
- (b) List the additives in a crankcase L.O of a 4 stroke Marine I.C. Engine and explain why they are used
- (6 Marks)
8. (a) What are the properties of a good L.O?
- (4 Marks)
- (b) What are the details given in a L.O analysis reports?
- (4 Marks)
- (c) What are different types of Main Bearing used for 2 stoke & 4 stroke Marine Diesel Engine?
- (6 Marks)

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering) - Semester – V
December 2015 - End Semester Examinations

Marine Internal Combustion Engine - I
Subject Code: UG11T1503/UG11T2503

Time: 3 Hours
Date: 14.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)

Compulsory Questions

- 1) (a) Define mean piston speed and list down the constraints for increasing the mean piston speed.
- (b) Explain compression ratio, pressure ratio and cutoff ratio for the dual cycle engines.
- (c) Compare tie rods and holding down bolts for Marine IC engines
- (d) Describe the various power ratings of the engine
- (e) Explain the relationship between heat balance and thermal efficiency of the engine
- (f) Explain how supercharging helps to improve the combustion efficiency and reducing specific fuel oil consumption
- (g) What is CCAI in relationship with ignition quality of fuel
- (h) Describe the reasons why jacket cooling water to be treated onboard
- (i) Compare briefly electronically controlled engines with conventional marine diesel Engines
- (j) Write down the measures to control NOX and SOX.

Part-B (5x14 = 70Marks)

Answer any five of the followings.

- 2) a) Explain the 4-stroke engine valve timing diagram with the help of crank angle diagram. (5 Marks)
- b) State the objectives of valve timing. (3 Marks)
- c) What is meant by scavenge efficiency? (3 Marks)
- (d) Discuss the effect of the shape of the ports and choking with carbon deposits on scavenge efficiency. (3 Marks)
- 3) (a) Describe, with the aid of a sketch, the operation of main engine exhaust valve which is hydraulically operated. (10 marks)
- (b) In a diesel engine late injection is indicated by black or grey exhaust smoke with low exhaust temperature, justify your answer (4 marks)
- 4) (a) Sketch and describe a large turbocharger for the Marine Diesel Engines. (7 Marks)
- (b) Give reasons for the relative positions of the various components shown. (7 Marks)

- 5) (a) Sketch and describe a fuel oil system of a large diesel engine, from a settling tank to main engine fuel injectors. (8 Marks)
- (b) Comment on the importance of:
- (i) Heating arrangement with temperature control. (2 Marks)
 - (ii) Prevention of air lock in the system. (2 Marks)
 - (iii) Purification of fuel. (2 Marks)
- 6) With reference to large slow-speed diesel engines discuss with reasons, the following
- (a) The increasing use of long-stroke crosshead engines. (7 Marks)
 - (b) The introduction of two-stage turbocharging. (7 Marks)
- 7) a) Draw a neat sketch of cylinder liner of large marine 2 stroke diesel engine of any reputed manufacturer where bore cooling method is used. (8 Marks)
- b) Label the sketch and briefly describe the special features of Liner. (6 Marks)
- 8) a) Describe how a crankcase explosion may occur and state the possible causes. (3 Marks)
- b) What safeguards may be used to reduce the risk of this occurring or of reducing subsequent damage? (8 Marks)
- c) List the procedures, which should be taken if such conditions occur. (3 marks)

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering)
Semester – II – December 2015 End Semester Examinations

Applied Thermodynamics - I
Subject Code: UG11T2203/ UG11T1203

Time: 3 Hours
Date: 14.12.2015

Max Marks: 100
Pass Marks: 50

Part-A

Answer the compulsory question
(3 Marks each x 10 = 30 Marks)

1. (a) State the Second Law of Thermodynamics.
- (b) A reversible process should not leave an evidence to show that the process had ever occurred. Explain.
- (c) What is Entropy?
- (d) Why is Carnot cycle is not practicable for a heat engine?
- (e) Define specific steam consumption or steam rate of a Rankine cycle.
- (f) What is perfect inter-cooling in multistage compressor?
- (g) Explain free air Delivery of a compressor.
- (h) What is mean Effective pressure of a steam engine?
- (i) Explain dry bulb temperature and wet bulb temperature of an atmosphere.
- (j) What is a compressed air motors?

Part-B

Answer any 5 from the remaining question
(14 Marks each x 5 = 70 Marks)

2. (a) Explain constant pressure heat addition process from water to superheated steam with the help of T-s and H-s diagrams . (5 Marks)
- (b) A reversible engine is supplied with heat from two constant temperature sources at 900K and 600K rejects heat to a constant temperature sink at 300K. The Engine develops a work of 90 kW and rejects heat at the rate of 56 kJ/sec. Find the heat supplied by each source and the efficiency of the engine. (9 Marks)

3. Dry saturated steam is supplied at 40 Bar to a turbine and the condenser pressure is 0.35 bar. If the plant operates on the Rankine cycle and the temperature rise of the cooling water in the condenser is 5.5K, calculate per kg of steam
- the work output neglecting the feed pump work.
 - the work required for the feed pump.
 - the amount of cooling water required through the condenser.
 - the Rankine efficiency
 - the specific steam consumption.
- (14 Marks)

4. A single stage, single acting air compressor running at 1000 R.P.M delivers air at 25 bar. For this purpose the induction and free air condition can be taken as 1.013 bar and 15 °C and the free air delivery as 0.25 m³/min . The clearance volume is 3% of the swept volume and the stroke bore ratio is 1.2/1. Take the index of compression and expansion is 1.4 . Calculate
- the bore and stroke of the piston.
 - the volumetric efficiency.
 - the indicated power.
 - the isothermal efficiency
- (14 Marks)

5. (a) State Amagat's Law of partial volume. (4 Marks)

- (b) An exhaust gas is analysed and is found to contain by volume 78 % N₂ , 12 % CO₂ and 10% O₂ . What is the corresponding gravimetric analysis? Calculate the molar mass of the mixture and the density if the temperature is 55 °C and the total pressure is 1 bar. (10 Marks)

6. (a) Explain Dew point . (4 Marks)

- (b) Air at a temperature of 22 °C has a specific humidity of 0.0092 kg /kg dry air. The barometric pressure of the air is 101 kN /m² . Determine
- the partial pressure of vapour in this air.
 - the partial pressure of this air .
 - the relative humidity of this air.
- (10 Marks)

7. (a) What is surface condenser? (4 Marks)

- (b) A surface condenser is required to deal with 2000 kg of steam per hour and the air leakage is estimated at 0.3 kg per 1000 kg of steam. The steam enters the condenser dry saturated at 38°C . The condensate is extracted at the lowest point of the condenser at a temperature of 36°C. The condensate loss is made up with water at 7 °C . Find the saving in condensate by fitting a separate air extraction pump which draws air over an air cooler. Assume that the air leaves the cooler at 27 °C . The pressure in the condenser can be assumed to remain constant. (10 Marks)

8. (a) Derive an expression to find the ideal intermediate pressure in an air compressor. (7 Marks)

- (b) A roots blower has an air capacity of 1 kg/sec. The pressure ratio through the blower is 2 to 1 with an intake pressure of 1 bar and 70 °C respectively. Determine the power required to drive the blower in kW. Take R = 0.29 Kg/kg K. (7 Marks)

INDIAN MARITIME UNIVERSITY
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December 2016 End Semester Examinations
B.Tech. (Marine Engineering) Fourth Semester

Fluid Mechancis - I (UG11T1405/ UG11T2405)

Date : 09.01.2017
Time: 3 Hrs

Maximum Marks: 100
Pass Marks : 50

Part A (3 x 10 = 30 Marks)
Compulsory Questions

1. a) What is surface tension ?
- b) What are dynamic and kinematic viscosities?
- c) What is metacentre ?
- d) What are dynamic and kinematic similarities ?
- e) Explain 'total pressure' and 'centre of pressure' .
- f) Define the term (i) Hydraulic gradient line and (ii) Total energy line.
- g) What is free vortex ?.
- h) Write Hegen-Poiseuille's equation/ Chezy's formula .
- i) How can you experimentally determine the orifice co-efficient ?
- j) Write the condition for maximum power transmission through a pipeline.

Part B (5x14=70 Marks)
Answer any five of the followings.

2. a) Explain dimensional homogeneity.
- b) Using Buckingham's Π theorem, show that the velocity through a circular orifice is given by $V = (2gH)^{1/2} \phi [D/H, (\mu/\rho V H)]$ where H is the head causing flow, D is the diameter of the orifice, μ is the co-efficient of viscosity, ρ is the mass density. (4 +10)
3. a) Explain Newton's law of viscosity . What are the CGS and S.I. units of Kinematic and Dynamic viscosities ?
- b) A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25 cm high. The space between the cylinders is filled with a liquid. If a torque of 1.20 kg-m is required to rotate the inner cylinder at 100 r.p.m., determine the viscosity of the fluid. (7+7)
4. a) Derive Bernoulli's equation of motion from Euler's equation of the motion. State the assumptions.
- b) The water is flowing through a taper pipe having diameters 20 cm at the upper end and 30 cm at the lower end, at the rate of 40 litres/sec. The intensity of pressure at the bottom end

is 2.5 kgf/cm^2 and the pressure at the upper end is 1 kgf/cm^2 . Determine the difference in datum head between the two ends. (7+7)

5. a) Deduce the expression for the force on the flat vertical plane moving in the direction of the jet and also work done per second by the jet on the plate.
b) A jet of water of diameter 10 cm strikes a flat plate normally with a velocity of 15 m/sec. The plate is moving with a velocity of 6m/sec in the direction of the jet and away from the jet. Find the force exerted by the jet on the plate and work done by the jet on the plate. (8+6)
6. a) Establish an expression for the head loss due to sudden enlargement in a pipeline..
b) At a sudden enlargement of a pipe line from 20 cm to 40 cm in diameter the rate of flow through a horizontal pipe is $0.25 \text{ m}^3/\text{sec}$. The pressure intensity in the smaller pipe is 1.2 kgf/cm^2 . Determine (i) loss of head due to sudden enlargement, (ii) pressure intensity in the large pipe, (iii) power loss due to enlargement. (7 +7)
7. a) Derive the expression for the horse power absorbed to overcome the viscous resistance in . journal bearing.
b) A shaft having a diameter of 5 cm rotates centrally in a journal bearing having a diameter of 5.015 cm and length 10 cm. The annular space between the shaft and the bearing is filled with oil having viscosity of 0.9 poise. Determine the power absorbed in the bearing when the speed of rotation is 600 r.p.m. (8 +6)
8. a) Show that the free surface of the liquid subjected to forced vortex is a paraboloid.
b) Prove that in case of forced vortex the rise of liquid level at the ends is equal to the fall of liquid level at the axis of rotation. (8+6)
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INDIAN MARITIME UNIVERSITY
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B.Tech.(Marine Engineering) - Semester V
December 2015 End Semester Examinations

Fluid Mechanics - II
Subject Code: UG11T2504/ UG11T1504

Time: 3 hrs
Date: 17.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)
Compulsory Questions

1. Compulsory short answer questions

- a. How is the choice of repeating variable made in case of Buckingham's method?
- b. List the dimensionless coefficients used in model testing of hydraulic turbines.
- c. Define operating point and shut off head of centrifugal pump.
- d. What are the advantages of installing air vessels in reciprocating pumps?
- e. Explain why backward curved blades are more popularly used.
- f. What is manometric head? How is it related to the internal losses of centrifugal pump?
- g. What is cavitation? When does it occur in reciprocating pump?
- h. Explain why the casing is of spiral shape with uniform change in area, in case of reaction turbines.
- i. Define speed ratio in case of turbines and pumps.
- j. State the difference between Pelton wheel and Francis turbines.

Part-B (5x14 = 70 Marks)
Answer any five of the followings.

2. A centrifugal pump lifts water against a static head of 40 m, of which 4 m is suction lift. The suction and delivery pipes are both 150mm diameter; the head loss in the suction pipe is 2.3 m and in the delivery pipe 7.4 m. The impeller is 420 mm diameter and 25mm wide at the mouth; it revolves at 1200 rpm and its effective valve angle at exit is 35 degree. If manometric efficiency is 82% and overall efficiency is 72 %; determine the discharge delivered by the pump and power required to drive the pump. Also find the pressure head indicated at the suction and delivery branches of the pump.
(14 Marks)
3. a) Derive an expression of specific speed of centrifugal pump.
b) Find the power required to drive a centrifugal pump which delivers 0.04 m³/sec of water to a height of 20 m through a 15 cm diameter and 100 m long pipe line. The overall efficiency of the pump is 70% and friction factor $f=0.06$ for the pipeline. Assume inlet losses in suction pipe equal to 0.33 m.
(4+10=14 Marks)
4. A Francis turbine works under a head of 120 m. The outer diameter and width are 2 m and 0.16 m. The inner diameter and width are 1.2 m and 0.27m. The flow of velocity at inlet is 8.1 m/sec. The whirl velocity at outlet is zero. The outlet blade angle is 16°. Assume hydraulic efficiency 90%. Determine (i) power developed, (ii) speed at inlet (iii) blade angle at inlet and (iv) guide blade angle at inlet.
(14 Marks)

5. A Pelton wheel has a mean bucket speed of 12 m/sec and is supplied with water at a rate of 750 litres per second under a head of 35 m. If the bucket deflects the jet through an angle of 160 degree, find the power developed by the turbine and its hydraulic efficiency. Take the co-efficient of velocity as 0.98. Neglect friction in the bucket. Also determine the overall efficiency of the turbine if its mechanical efficiency is 80%. (14 Marks)
6. A double acting reciprocating pump, running at 40 rpm, is discharging 1.0 m³ of water per minute. The pump has a stroke of 400 mm. The diameter of the piston is 200mm. The delivery and suction head are 20 m and 5 m respectively. Find the percentage of slip of the pump and power required to drive the pump. (14 Marks)
7. a) Draw a complete indicator diagram of single acting Reciprocating pump and mark on it the effect of acceleration and friction in suction and delivery pipes.
b) Derive the expression of rate of flow of liquid into and from the air vessel for single acting reciprocating pump and from that expression, find the crank angles at which there will be no flow into or from the air vessel. (4 + 10 – 14 Marks)
8. A pump running at 1450 rpm with impeller diameter of 20cm is geometrically similar to a pump with 30 cm impeller diameter running at 950 rpm. The discharge of the large pump at the maximum efficiency was 200 litres/sec at a total head of 25 m. Determine the discharge and the head of the smaller pump at the maximum efficiency conditions. Also determine the ratio of power required. (14 Marks)

INDIAN MARITIME UNIVERSITY
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May/June 2015 End Semester Examinations

SEMESTER – IV, B.TECH (MARINE ENGINEERING)

FLUID MECHANICS- I (T 2405 / T 1405)

Date: 19.06.2015
Time: -3 Hrs

Max. Marks: 100
Pass Marks: 50

PART – A
(Compulsory Questions)

(3 x 10 = 30 Marks)

1. a) Define. Surface tension and how is it related to capillary rise ?
- b) Write the units of dynamic and kinematic viscosities?
- c) Explain geometric and dynamic similarities .
- d) What are dynamic and kinematic similarities ?
- e) Explain total force and centre of pressure of an immersed surface. .
- f) Define the term (i) Hydraulic gradient line and (ii) Total energy line.
- g) Compare between forced vortex and free vortex flow..
- h) State Darcy's formula and Chezy's formula..
- i) How can you use venturimeter to measure discharge.
- j) Define steady and unsteady flow.

PART – B
(Answer any five of the following)

(5 x 14 = 70 Marks)

2. a) Deduce the expression for Reynolds number with the help of dimensional analysis.
- b) The pressure difference Δp in a pipe of diameter D and length l due to turbulent flow depends on the viscosity μ , density and roughness k . Using Buckingham's π theorem obtain an expression for Δp

(6 + 8)

3. a) Explain Newton's law of viscosity. What are real and ideal fluids? (7)
- b) A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is to be determined. If a torque of 1.20 kg m is required to rotate the inner cylinder at 100 r.p.m., determine the viscosity. (7)
4. a) Derive Bernoulli's equation of motion. (7)
- b) The water is flowing through a taper pipe of length 100 m having diameters 60 cm at the upper end and 30 cm at the lower end, at the rate of 50 litres/sec. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher end is 2.0 kgf/cm^2 . (7)
5. a) Deduce the expression for the force on the stationary inclined flat plate and find also the horizontal and vertical components of this force.
- b) Calculate the force exerted by a jet of water of diameter 7.5 cm on a stationary flatplate, when the jet strikes the plate normally with a velocity of 20 m/sec. (8+6)
6. a) Derive the expression for maximum efficiency of transmission of power in a pipeline.
- b) A pipe of diameter 30 cm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipeline is 500m. Find the maximum power available at the outlet of the pipe and take the value of $f=0.006$ (7+7)
7. a) Derive the expression for the horse power absorbed to overcome the viscous resistance in a foot-step bearing.
- b) Find the power required to rotate a circular disc of diameter 20 cm at 1000 r.p.m. The circular disc has a clearance of 0.04 cm from the bottom flat plate and the clearance contains oil of viscosity 1.05 poise. (8+6)
8. Show that in case of a forced vortex, the rise of liquid level at the ends is equal to the fall of liquid level at the axis of rotation. (14)

INDIAN MARITIME UNIVERSITY
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DEPARTMENT OF MARINE ENGINEERING
TERM END EXAMINATION – December 2015

Sub Code: UG11T2501/UG11T1501

Time: 0300 Hrs

Sub Name: **Material Science**

Max Marks-100

Semester: 5th

Pass Marks-50

Part-A (3x10=30 Marks)

Compulsory Questions

- 1) (a) State Pauli's exclusion law of principle?
(b) Define co-ordination number. Mention the co-ordination number of FCC, HCP & BCC structure
(c) Why "Grey cast iron" is preferred over "White cast iron".
(d) Name different types of Destructive Tests to determine the suitability of a metal?
What is the significance of B.H.N.?
(e) State Gibbs phase rule.
(f) What are "Liquidus line" and "Solidus Line"
(g) What are the main purposes of Heat Treatment of a material?
(h) What are 'Stress Concentration' and 'Material Fatigue'?
(i) Briefly describe the reason behind rusting in iron structure in presence of water-drop / moisture?
(j) Explain with reasons for selection of materials for engine seating?

Part-B (5x14 = 70Marks)

Answer any five of the followings.

- 2) (a) Derive the atomic radius for B.C.C & F.C.C crystal lattice (7)
(b) Explain the ionic, covalent, and metallic bonding with suitable example. (7)
3. What are the differences between Izod and Charpy Impact test? Describe fluorescent die penetration test procedure for crack detection. (8 + 6)
Or,
a. Draw a neat diagram of 'Impact Test' and explain in brief.
b. Find out the energy to rupture the test piece, assume require data.
c. What are the standard sizes of the specimen to be used for Impact testing? (10 + 2 + 2)
4. Draw a neat diagram of iron carbide equilibrium diagram and explain it briefly. (14)
- 5.(a) What is meant by annealing? Explain the various types of annealing with suitable examples (14)
OR
(b) Explain the following i) Carburising ii) Nitriding iii) Cyaniding (14)

6.a. Explain briefly fatigue testing with a neat sketch.

b. What is S-N curve?

(10 + 4)

7.a. What is meant by corrosion ?

b. How does "Sacrificial Anode" prevent corrosion? Give an example.

c. Explain the term anodizing and phosphating?

(3 + 5 + 6)

8) Write a brief note on Refractories, mentioning it's different types & properties. What is dimensional stability of refractory material?

(14)

INDIAN MARITIME UNIVERSITY
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MATERIAL SCIENCE
SEMESTER – V, B.TECH(MARINE ENGINEERING): DEC/JAN 2013-14
SUBJECT CODE: T 1501
(AY 2009-10 to 2012-13 batches only)

Date: 13.12.2013

Time: 3 Hrs
Maximum Marks:100
(Weightage 70%)

SECTION - A

Question No. 1 is compulsory

10 x 3 = 30 M

1. (a) Define briefly with suitable examples, the principal types of primary bonds holding atoms of materials.
- (b) State the main differences between cast iron and steel
- (c) State briefly how refractories are classified.
- (d) Name five important mechanical tests which give valuable information about metals and alloys.
- (e) Discuss the types of solid solutions that are formed among solids.
- (f) How do you compare the two heat treatment processes of annealing and normalizing.
- (g) What is a S-N curve? What can we get from the curve?
- (h) How does "Sacrificial Anode" prevent corrosion? Give an example.
- (i) Briefly give the effects of the following elements on steel.
Carbon, Sulphur and Phosphorus
- (j) How do you define "Allotropy"? Give a suitable example.

SECTION - B

Answer any five questions from following eight questions

2. Describe the different processes of increasing the surface hardness of a material by changing the composition of surface material. Also, discuss their advantages/ disadvantages. (14)

2. Explain the following non-destructive test
- a. Fluorescent
 - b. Radiography
 - c. Ultrasonic

3. Explain the iron-carbide equilibrium diagram (OR)

Explain the Time Temperature Transformation curve with suitable example

4. What is meant by annealing? Explain the various types of annealing with an example?
5. a. Define the term creep? Explain the various types of creep with suitable diagram?
b. Explain the fatigue testing machine with a suitable diagram
6. What is meant by corrosion? Explain the various types of corrosion with an example?
7. a. What are the applications of chromium, titanium in ship board systems?
b. What are refractories? Explain their various types and its uses?



INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)
East Coast Road, Uthandi, Chennai-600 119.

B.Tech. (MARINE ENGINEERING)
December 2012 Examinations
FIFTH SEMESTER EXAMINATION
Material Science

Old Sub Code: UG/ME/BS/T/311

QP Code: T0511501

Date: 17.12.12

Max Marks: 100

Time : 3 Hrs

Note: - (i) Attempt six questions

(ii) Question No. 1 is compulsory

PART A

ANSWER THE COMPULSORY QUESTION

(10 x 3 = 30 Marks)

1.
 - (i) Explain briefly the term "Ionization Potential".
 - (ii) Write short notes on "Principal Quantum No" and "Azimuthal Quantum No".
 - (iii) What is the basic difference between "Cast Iron" and "Steel"?
 - (iv) Name five important mechanical tests which give valuable informations about metals and alloys.
 - (v) What do you understand by "Substitutional Solid Solution": and "Interstitial Solid Solution"?
 - (vi) What are "Liquidus Line" and "Solidus Line"?
 - (vii) What are the main purposes of Heat Treatment of a material?
 - (viii) What is "Fatigue Limit" of a material?
 - (ix) What is the function of a "Sacrificial Anode"?
 - (x) Which alloying elements will give the following properties to an alloy of steel for use in Engineering?
 - (1) Corrosion Resistance
 - (2) Hardness

PART B

ANSWE ANY FIVE OUT OF SEVEN QUESTIONS

(5 x 14 = 70 MARKS)

2. Use two labelled sketches to show schematically the differences between (a) The bonding of atoms in a solid metal such as Sodium, and (2) The bonding of atoms in solid nonmetal such as Sodium Chloride.
3. (a) Write short notes on "Grey Cast Iron" and "White Cast Iron". (7 MARKS)
(b) Briefly describe the procedure of carrying out the "Tensile Test" on a sample of material. (7 MARKS)
4. Show how an equilibrium diagram for an alloy of "A" and "B" can be drawn when "A" and "B" are completely soluble in liquid as well as solid state.
5. Describe the different methods involved to increase the surface hardness of different steel products.
6. Explain the process of failure of a material due of fatigue and show what appearances the fractured surfaces may have.
7. Discuss the different means to control and prevent corrosion in materials.
8. Discuss the materials to be selected for manufacture of the following components with their approximate compositions:-
 - (a) Stern Frame
 - (b) Engine crankshaft
 - (c) Diesel Engine Cylinder cover
 - (d) Diesel Engine Cylinder Liner

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

December 2016 End Semester Examinations
B.Tech. (Marine Engineering) Second Semester

Applied Thermodynamics - I (UG11T1203/ UG11T2203)

Date : 04.01.2016
Time: 3 Hrs

Maximum Marks: 100
Pass Marks : 50

PART-A (10×3=30)
ANSWER THE COMPULSORY QUESTION

1. a) State Clausius statement of second law of thermodynamics.
- b) Define entropy and change of entropy.
- c) Mention the improvements made to increase the ideal efficiency of rankine cycle.
- d) What are the effects of condenser pressure on the rankine cycle.
- e) Define Specific steam consumption of an ideal rankine cycle.
- f) What are the factors that affect the volumetric efficiency of a reciprocating compressor.
- g) What is compression ratio for reciprocating air compressors?
- h) What is meant by free air delivered.
- i) What is the difference between air heat pump and refrigerator.
- j) State Amagats law of partial volume.

PART-B (5×14=70)
ANSWER ANY FIVE OF THE FOLLOWING

2. a) Dry saturated steam at 100 bar expands isothermally and reversibly to a pressure of 10 bar. Calculate the heat supplied and the work done per kilogram of steam during the process. (8 marks)
- b) Steam at 100 bar, 375°C expands isentropically in a cylinder behind a piston to a pressure of 10 bar. Calculate the work done per kilogram of steam. (6 marks)
3. Explain with block diagram and T-S diagram, The process of regenerative rankine cycle and how the efficiency of the cycle could be improved. (14 marks)

4. a) Explain modified rankine cycle in steam engines. (7 marks)
- b) Consider a steam power plant operating on an ideal reheat rankine cycle, the steam enters the H.P turbine at 30 bar and 350°C, after expansion to 5 bar ,the steam is reheated to 350°C and then expanded the L.P turbine to the condenser pressure of 0.075 bar. Determine the thermal efficiency of the cycle and the quality of the steam at the outlet of the L.P turbine. (7 marks)
5. A single cylinder single acting reciprocating compressor takes in 8 m³ /min of air at 1 bar and 15°C and compress into 7 bar. Calculate the saving in the power required when the Compression Process is changed from adiabatic compression to isothermal compression. (14 marks)
6. a) A single acting air compressor compresses air from 1 bar to 7 bar, the clearance volume is 2 litres, the compression and expansion follows the law $PV^{1.3} = C$. If the volumetric efficiency of a compressor is 85%.find the stroke volume of the cylinder. Assume diameter of the piston is equal to stroke. (8 marks)
- b) Explain Multi stage reciprocating air compressor with intercooler. (6 marks)
7. Atmospheric air at 760 mm of Hg barometric pressure has 25°C dry bulb temperature and 15°C wet bulb temperature. with the help of psychometric chart, determine a) relative humidity b)humidity ratio c) dew point temperature d)enthalpy of air per kg of dry air e)partial pressure of vapour f)saturation pressure corresponding to dry bulb temperature of 25°C g)saturation pressure corresponding to wet bulb temperature of 15°C h)volume of air/kg of dry air. (14 marks)
8. A refrigerator operates as reversed carnot cycle. Determine the power required to drive refrigerator between temperatures of 42° c and 4° c if heat at rate of 2 KJ/sec is extracted from low temperature region. (14 marks)

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

End Semester Examination December 2017

Programme: B.Tech (Marine Engineering)

Semester: V

Subject Name: Marine Auxiliary Machines - I

Subject Code: UG11T2505/1505

Date: 13.12.2017

Maximum Marks: 100

Time: 3 Hours

Pass Marks: 50

Part - A

(All questions are compulsory) (10X3 = 30 Marks)

- 1) (a) Briefly explain the factors to be considered while selecting the pipeline material on board.
- (b) Draw and label a fresh water hydrophore system.
- (c) Sketch and explain the magnetic filter used in marine applications.
- (d) Briefly explain the concept of cavitation in a centrifugal pump.
- (e) With the help of a block diagram explain the RO process used for production of fresh water on board.
- (f) Sketch and label a typical air bottle used on board with associated mountings.
- (g) List down the criteria for discharging machinery space bilges as per MARPOL Annex I.
- (h) Briefly discuss the concept of homogenizers.
- (i) Sketch and explain the working of a Bow thruster.
- (j) List down the various stresses acting on Tail end, Intermediate and Thrust shafts.

Part - B

(Answer any 5 of the following seven questions) (5X14 = 70 Marks)

- 2) a) Sketch and explain the typical Lub Oil system used for Main Propulsion Engines. Discuss how the Lub oil temperature is automatically controlled. (14 marks)
- 3) a) Sketch and explain simple line diagram for HFO and DO bunkering. What are the safety fittings incorporated in the system? (7 marks)
- b) Explain the working of a Gear pump with the help of a neat diagram. (7 marks)
- 4) Sketch and explain the working of a two stage reciprocating air compressor. (14 marks)
- 5) Sketch and explain the working of a two stage Oily water separator. Discuss STOKES Law in this context. (14 marks)

- 6) Explain the working of a Four ram electro-hydraulic steering gear with the help of a neat diagram. Elaborate the concept of hunting gear. (14 marks)
- 7) Explain a type of biological sewage treatment plant with the help of a neat diagram. (14 marks)
- 8) a) Explain Pilgrim nut method for fitting propellers. (6 marks)
b) Sketch and label oil lubricated stern tube arrangement. (8 marks)

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering) - Semester – V
December 2015 - End Semester Examinations

Marine Internal Combustion Engine - I
Subject Code: UG11T1503/UG11T2503

Time: 3 Hours
Date: 14.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)

Compulsory Questions

- 1) (a) Define mean piston speed and list down the constraints for increasing the mean piston speed.
(b) Explain compression ratio, pressure ratio and cutoff ratio for the dual cycle engines.
(c) Compare tie rods and holding down bolts for Marine IC engines
(d) Describe the various power ratings of the engine
(e) Explain the relationship between heat balance and thermal efficiency of the engine
(f) Explain how supercharging helps to improve the combustion efficiency and reducing specific fuel oil consumption
(g) What is CCAI in relationship with ignition quality of fuel
(h) Describe the reasons why jacket cooling water to be treated onboard
(i) Compare briefly electronically controlled engines with conventional marine diesel Engines
(j) Write down the measures to control NOX and SOX.

Part-B (5x14 = 70Marks)

Answer any five of the followings.

- 2) a) Explain the 4-stroke engine valve timing diagram with the help of crank angle diagram. (5 Marks)
b) State the objectives of valve timing. (3 Marks)
c) What is meant by scavenge efficiency? (3 Marks)
d) Discuss the effect of the shape of the ports and choking with carbon deposits on scavenge efficiency. (3 Marks)
- 3) (a) Describe, with the aid of a sketch, the operation of main engine exhaust valve which is hydraulically operated. (10 marks)
(b) In a diesel engine late injection is indicated by black or grey exhaust smoke with low exhaust temperature, justify your answer (4 marks)
- 4) (a) Sketch and describe a large turbocharger for the Marine Diesel Engines. (7 Marks)
(b) Give reasons for the relative positions of the various components shown. (7 Marks)

4. a) Why supercharging of a diesel engine is done ?
- b) Name various methods of turbocharging used for diesel engines and give a comparative study of them ?
- c) Why scavenge air coolers are fitted in Diesel Engine? What are the consequences of inefficient cooling?
- (2 + 8 + 4)
5. a) Name three grades of fuel oil generally used on board ships and specify place of use.
- b) Explain the terms: atomisation, penetration, turbulence and their effect on combustion
- c) What is flash point, ignition point ?
- d) Explain the treatment of HFO (starting from DB tank) for burning in the engine.
- (3 + 3 + 2 + 6)
6. a) Explain the process of Starting Air line explosion.
- b) How such explosion is prevented ?
- c) How air starting line is protected from damage due to explosion ?
- d) How will you detect leakage in cylinder air starting valve ?
- (7 + 2 + 3 + 2)
7. a) Draw and label a sketch of two piece piston of a medium speed engine?
Why the piston is made in two pieces ?
- b) With the help of simple line sketch explain three methods of cooling trunk type pistons.
- c) With help of sketch, describe three different types of piston rings.
Make mention of their special features.
- (8 + 3 + 3)
8. a) What is surging of turbocharger?
- b) How surging of turbocharger is prevented ?
- c) Describe various routine maintenance work necessary for efficient operation of main engine turbocharger?
- (4+5+5)
9. Elaborate the steps taken by designers during last 40 years to improve the fuel efficiency of Marine Diesel Engines and reduction of environmental pollution.
- (14)

Himanshu
Aditya

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering) - Semester - V
December 2015 - End Semester Examinations

Marine Internal Combustion Engine - I
Subject Code: UG11T1503/UG11T2503

Time: 3 Hours
Date: 14.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)

Compulsory Questions

- 1) ~~(a)~~ Define mean piston speed and list down the constraints for increasing the mean piston speed.
- ~~(b)~~ Explain compression ratio, pressure ratio and cutoff ratio for the dual cycle engines.
- ~~(c)~~ Compare tie rods and holding down bolts for Marine IC engines
- ~~(d)~~ Describe the various power ratings of the engine
- ~~(e)~~ Explain the relationship between heat balance and thermal efficiency of the engine
- ~~(f)~~ Explain how supercharging helps to improve the combustion efficiency and reducing specific fuel oil consumption
- ~~(g)~~ What is CCAI in relationship with ignition quality of fuel (low viscosity with high density may indicate poor ignition)
- (h). Describe the reasons why jacket cooling water to be treated onboard
- (i) Compare briefly electronically controlled engines with conventional marine diesel Engines
- (j) Write down the measures to control NOX and SOX.

Part-B (5x14 = 70Marks)

Answer any five of the followings.

- 2) a) Explain the 4-stroke engine valve timing diagram with the help of crank angle diagram. (5 Marks)
- b) State the objectives of valve timing. (3 Marks)
- c) What is meant by scavenge efficiency? (3 Marks)
- (d) Discuss the effect of the shape of the ports and choking with carbon deposits on scavenge efficiency. (3 Marks)
- 3) (a) Describe, with the aid of a sketch, the operation of main engine exhaust valve which is hydraulically operated. (10 marks)
- (b) In a diesel engine late injection is indicated by black or grey exhaust smoke with low exhaust temperature, justify your answer (4 marks)
- 4) (a) Sketch and describe a large turbocharger for the Marine Diesel Engines. (7 Marks)
- (b) Give reasons for the relative positions of the various components shown. (7 Marks)

4. a) Why supercharging of a diesel engine is done ?
 b) Name various methods of turbocharging used for diesel engines and give a comparative study of them ?
 c) Why scavenge air coolers are fitted in Diesel Engine? What are the consequences of inefficient cooling?

(2 + 8 + 4)

5. a) Name three grades of fuel oil generally used on board ships and specify place of use.
 b) Explain the terms: atomisation, penetration, turbulence and their effect on combustion
 c) What is flash point, ignition point ?
 d) Explain the treatment of HFO (starting from DB tank) for burning in the engine.

(3 + 3 + 2 + 6)

Imp 6

- a) Explain the process of Starting Air line explosion.
 b) How such explosion is prevented ?
 c) How air starting line is protected from damage due to explosion ?
 d) How will you detect leakage in cylinder air starting valve ?

(7 + 2 + 3 + 2)

7. a) Draw and label a sketch of two piece piston of a medium speed engine?
 Why the piston is made in two pieces ?
 b) With the help of simple line sketch explain three methods of cooling trunk type pistons.
 c) With help of sketch, describe three different types of piston rings.
 Make mention of their special features.

(8 + 3 + 3)

8. a) What is surging of turbocharger?
 b) How surging of turbocharger is prevented ?
 c) Describe various routine maintenance work necessary for efficient operation of main engine turbocharger?

(4+5+5)

9. Elaborate the steps taken by designers during last 40 years to improve the fuel efficiency of Marine Diesel Engines and reduction of environmental pollution.

(14)

Meppur

INDIAN MARITIME UNIVERSITY
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MARINE INTERNAL COMBUSTION ENGINE I
SEMESTER – V, B.TECH(MARINE ENGINEERING): DEC/JAN 2013-14
SUBJECT CODE: T 1503
(AY 2009-10 to 2012-13 batches only)

Date: 18.12.2013

Time: 3 Hrs
Maximum Marks:100
(Weightage 70%)

- Note : i) Use of Non programmable scientific calculator is allowed.
ii) Attempt six questions.
iii) Question in SECTION- A is compulsory.

SECTION - A

Question No. 1 is compulsory

10 x 3 = 30 M

1. a) Draw timing diagram of a 2-Stroke Diesel Engine and name the processes of the complete cycle.
- b) Briefly explain the terms : Mean Piston speed, M.C.R and Ignition delay .
- c) Why tie rods are used for diesel engines ?
- d) Name various types of scavenging system used for Marine Diesel Engine name the best type with justification.
- e) What are the various impurities generally found in Heavy Fuel oil used in large 2-stroke Diesel Engine. ?
- f) What are the various methods used for control of NO_x in diesel engine .
- g) Justify the cooling medium you would use for cooling of 2-stroke X-hd type piston.
- h) Explain briefly , how severity of crankcase explosion in diesel engine is reduced.
- i) Briefly explain heat treatment methods used for Crankshaft.
- j) Prepare a list of factors that influence combustion in diesel engine .

SECTION - B

Answer any five from the following:

(5 x 14 = 70)

2. a) Why is it difficult to lubricate X-hd bearing of a diesel engine .
- b) Explain at least two methods which are in use to overcome this problem (4 + 5 + 5)
3. a) Draw a neat sketch of Cylinder Liner of large 2-Stroke Marine Diesel Engine of any reputed manufacturer where bore cooling method is used. Label the sketch and brief describe including the special features of the liner.
- b) Show all sealing areas on the liner and explain the sealing method & material.
- c) What is the quality of finish provided to the liner surface and how is it achieved ? (8 + 3 + 3)

4. a) Why supercharging of a diesel engine is done ?
- b) Name various methods of turbocharging used for diesel engines and give a comparative study of them ?
- c) Why scavenge air coolers are fitted in Diesel Engine? What are the consequences of inefficient cooling? (2 + 8 + 4)
5. a) Name three grades of fuel oil generally used on board ships and specify place of use.
- b) Explain the terms: atomisation, penetration, turbulence and their effect on combustion
- c) What is flash point , ignition point ?
- d) Explain the treatment of HFO (starting from DB tank) for burning in the engine. (3 +3 + 2 + 6)
6. a) Explain the process of Starting Air line explosion.
- b) How such explosion is prevented ?
- c) How air starting line is protected from damage due to explosion ?
- d) How will you detect leakage in cylinder air starting valve ? (7 + 2 + 3 + 2)
7. a) Draw and label a sketch of two piece piston of a medium speed engine?
Why the piston is made in two pieces ?
- b) With the help of simple line sketch explain three methods of cooling trunk type pistons.
- c) With help of sketch, describe three different types of piston rings.
Make mention of their special features. (8 + 3 + 3)
8. a) What is surging of turbocharger?
- b) How surging of turbocharger is prevented ?
- c) Describe various routine maintenance work necessary for efficient operation of main engine turbocharger? (4+5+5)
9. Elaborate the steps taken by designers during last 40 years to improve the fuel efficiency of Marine Diesel Engines and reduction of environmental pollution. (14)

Koyu

INDIAN MARITIME UNIVERSITY
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FLUID MECHANICS II
SEMESTER - V, B.TECH(MARINE ENGINEERING): DEC/JAN 2013-14
SUBJECT CODE: T 1504
(AY 2009-10 to 2012-13 batches only)

Date: 20.12.2013

Time: 3 Hrs
Maximum Marks:100
(Weightage 70%)

SECTION - A

1. Compulsory short answer question (3X10 = 30 Marks)

- What are superfluous variables in dimensional analysis? Give an example.
- What is the difference between "undistorted" and "distorted" models? Why are they used?
- What is the difference between single acting and double acting reciprocating pump?
- Why is the speed of a reciprocating pump restricted by the certain pressure on the indicator diagram?
- Give advantages & disadvantages of a centrifugal pump over reciprocating pump.
- Give the function of (i) Volute & (ii) Diffuser in a centrifugal pump.
- What is the difference between impulse & reaction turbines?
- What are the types of similarities to be established between its model and the prototype.
- Explain NPSH
- Define with respect to turbine, "efficiency". List the factors it depends on.

SECTION - B

Five out of Eight Questions to be answered (14 X 5 = 70 Marks)

2. A 1:10 scale model of a sub-marine moving far below the surface of water is tested in a water tunnel. If the speed of the prototype is 8 m/s, determine the corresponding velocity of water in the tunnel. Also determine the ratio of the drag for the model and the prototype.

$$v_{\text{seawater}} = 1.121 \times 10^{-6} \text{ m}^2/\text{s}$$

$$v_{\text{water}} = 1.00 \times 10^{-6} \text{ m}^2/\text{s}$$

$$\rho_{\text{seawater}} = 1027 \text{ Kg/m}^3$$

$$\rho_{\text{water}} = 1000 \text{ Kg/m}^3$$

Would the result be true if the prototype were to move close to the surface? Explain. (14)

3. List all the variables that may influence the motion of a moving body fully submerged in a fluid. A solid sphere of diameter 100 mm moves in water at 5 m/s. It experiences a drag of magnitude 19.62 N. What would be the velocity of 5 m diameter sphere moving in air in order to ensure similarity? What will be the drag experienced by it? State which law governs the similarity.

Take

$$\rho_{\text{water}} = 1000 \text{ Kg/m}^3$$

$$\rho_{\text{air}} = 1.2 \text{ Kg/m}^3$$

$$v_{\text{air}} = 13 v_{\text{water}}$$

(14)

4. Define percentage slip and separation with reference to positive displacement pumps. A single acting reciprocating pump has a plunger of diameter 250 mm and stroke of 350 mm. If the speed of the pump is 60 rpm and it delivers 16.5 litres per second of water against a suction head of 5 m and a delivery head of 20 m; find the theoretical discharge, coefficient of discharge, the slip, the percentage slip of the pump and the power required to drive the pump. (14)
5. Why a reciprocating is called positive displacement pump? A double acting reciprocating pump has piston of diameter 250 mm and piston rod of diameter 50 mm which is on one side only. Length of piston stroke is 350 mm and the speed of crank moving the piston is 60 rpm. The suction and delivery heads are 4.5 m and 18 m respectively. Determine the discharge capacity of the pump and the power required to operate the pump. (14)
6. What is meant by, 'Priming' of a pump? A centrifugal pump has an impeller 0.5 m outer diameter and when running at 600 rpm discharges water at the rate of 8000 litres / min against a head of 8.5 m. The water enters the impeller without whirl and shock. The inner diameter is 0.25 m, and the vanes are set back at outlet at an angle of 45° and the area of flow which is constant from inlet to outlet of the impeller is 0.06 m^2 . Determine (a) the manometer efficiency of the pump (b) the vane angle at inlet (c) the least speed at which the pump commences to work. (14)
7. Find the power required to drive a centrifugal pump which delivers 40 litres of water per second to a height of 20 m through a 150 mm diameter and 100 m long pipeline. The overall efficiency of pump is 70% and Darcy's $f = 0.06$ for the pipeline. Assume inlet losses in suction pipe equal to 0.33 m. (14)
8. Why does cavitation occur in hydraulic machines? (14)
 The following data were obtained from a test on a Pelton wheel:
 Head at the base of the nozzle = 32 m;
 Discharge of the nozzle = $0.18 \text{ m}^3/\text{s}$;
 Area of the jet = 7500 sq. mm;
 Power available at the shaft = 44 kW and
 Mechanical efficiency = 94 %
 Calculate the power lost (i) in the nozzle; (ii) in the runner; (iii) in mechanical friction.
9. Explain the term specific speed as applied to hydraulic turbines. A turbine develops 7460 KW under a head of 24.7 m at 135 rpm. What is the specific speed?
 What would be the normal speed and output under a head of 19.5 m. (14)

INDIAN MARITIME UNIVERSITY
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NAVAL ARCHITECTURE I
SEMESTER – V, B.TECH(MARINE ENGINEERING): DEC/JAN 2013-14
SUBJECT CODE: T 1506
(AY 2009-10 to 2012-13 batches only)

Date: 26.12.2013

Time: 3 Hrs
Maximum Marks:100
(Weightage 70%)

SECTION -A

Question No.1 is Compulsory

(3X10=30 marks)

1. a) Define TPC and explain why TPC varies with different draughts.
- b) With respect to ship's Lines Plan, draw the following:-
 - i) Sheer, ii) half breadth plan iii) body plan.
- c) Distinguish between 'Dead Weight' & 'Load Displacement' of a ship
- d) With respect to transverse stability of a ship, draw a typical 'Curve of Statical Stability' and state its uses
- e) The residuary resistance of a ship may be divided into components. Identify these components.
- f) With respect to the transverse stability of a Wall Sided Ship 'GZ' may be expressed as
 - i) $GZ = (BM + \frac{1}{2} GM \tan^2 \theta) \sin \theta$,
 - ii) $GZ = GM (BM + \frac{1}{2} \tan^2 \theta) \sin \theta$,
 - iii) $GZ = (GM + \frac{1}{2} BM \tan^2 \theta) \sin \theta$Identify the correct expression and name the symbols associated therewith
- g) State the types of waves formed, when the ship moves through the water *bow wave,*
- h) State the basic necessities for isolating a flooded compartment in a ship.
- i) With respect to water tight subdivision in a ship, what is meant by 'Floodable Length' and 'Permissible Length'.

6. a) Show the effect of tank divisions on free surface when a rectangular tank is

i) having a mid-length transverse division

ii) having two longitudinal divisions forming three equal tanks.

b) An inclining experiment was carried out on a ship of 4000tonne displacement, when masses of 6 tonne were moved transversely through 13.5m. The deflections of a 7.5m pendulum were of 81,78,85,83,79,82,84 and 80mm respectively. Calculate the metacentre height.

7. A vessel has the following righting levers at a particular draught, based on an assumed KG of 7.2m.

Θ	0°	15°	30°	45°	60°	75°	90°
GZ	0	0.43	0.93	1.21	1.15	0.85	0.42 m

The vessel is loaded to this draught but the actual KG is found to be 7.8m and the GM 1.0m.

8.

A ship 150m long floats at draughts of 8.20m forward and 8.90m aft. MCT1cm 55tonne m, TPC 28 and LCF 1.5m aft of midships. It is necessary to bring the vessel to an even keel and a double bottom tank 60m forward of midships is available.

Calculate the mass of water required and final draught.

INDIAN MARITIME UNIVERSITY
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B.Tech.(Marine Engineering) - Semester V
December 2015 End Semester Examinations

Fluid Mechanics - II
Subject Code: UG11T2504/ UG11T1504

Time: 3 hrs
Date: 17.12.2015

Max Marks: 100
Pass Marks: 50

Part-A (3x10=30 Marks)
Compulsory Questions

1. Compulsory short answer questions

- a. How is the choice of repeating variable made in case of Buckingham's method?
- b. List the dimensionless coefficients used in model testing of hydraulic turbines.
- c. Define operating point and shut off head of centrifugal pump.
- d. What are the advantages of installing air vessels in reciprocating pumps?
- e. Explain why backward curved blades are more popularly used.
- f. What is manometric head? How is it related to the internal losses of centrifugal pump?
- g. What is cavitation? When does it occur in reciprocating pump?
- h. Explain why the casing is of spiral shape with uniform change in area, in case of reaction turbines.
- i. Define speed ratio in case of turbines and pumps.
- j. State the difference between Pelton wheel and Francis turbines.

Part-B (5x14 = 70 Marks)
Answer any five of the followings.

2. A centrifugal pump lifts water against a static head of 40 m, of which 4 m is suction lift. The suction and delivery pipes are both 150mm diameter; the head loss in the suction pipe is 2.3 m and in the delivery pipe 7.4 m. The impeller is 420 mm diameter and 25mm wide at the mouth; it revolves at 1200 rpm and its effective valve angle at exit is 35 degree. If manometric efficiency is 82% and overall efficiency is 72 %; determine the discharge delivered by the pump and power required to drive the pump. Also find the pressure head indicated at the suction and delivery branches of the pump.
(14 Marks)
3. a) Derive an expression of specific speed of centrifugal pump.
b) Find the power required to drive a centrifugal pump which delivers 0.04 m³/sec of water to a height of 20 m through a 15 cm diameter and 100 m long pipe line. The overall efficiency of the pump is 70% and friction factor $f=0.06$ for the pipeline. Assume inlet losses in suction pipe equal to 0.33 m.
(4+10=14 Marks)
4. A Francis turbine works under a head of 120 m. The outer diameter and width are 2 m and 0.16 m. The inner diameter and width are 1.2 m and 0.27m. The flow of velocity at inlet is 8.1 m/sec. The whirl velocity at outlet is zero. The outlet blade angle is 16°. Assume hydraulic efficiency 90%. Determine (i) power developed, (ii) speed at inlet (iii) blade angle at inlet and (iv) guide blade angle at inlet.
(14 Marks)

5. A Pelton wheel has a mean bucket speed of 12 m/sec and is supplied with water at a rate of 750 litres per second under a head of 35 m. If the bucket deflects the jet through an angle of 160 degree, find the power developed by the turbine and its hydraulic efficiency. Take the co-efficient of velocity as 0.98. Neglect friction in the bucket. Also determine the overall efficiency of the turbine if its mechanical efficiency is 80%. (14 Marks)

6. A double acting reciprocating pump, running at 40 rpm, is discharging 1.0 m³ of water per minute. The pump has a stroke of 400 mm. The diameter of the piston is 200mm. The delivery and suction head are 20 m and 5 m respectively. Find the percentage of slip of the pump and power required to drive the pump. (14 Marks)

7. a) Draw a complete indicator diagram of single acting Reciprocating pump and mark on it the effect of acceleration and friction in suction and delivery pipes.

b) Derive the expression of rate of flow of liquid into and from the air vessel for single acting reciprocating pump and from that expression, find the crank angles at which there will be no flow into or from the air vessel.

(4 + 10 – 14 Marks)

8. A pump running at 1450 rpm with impeller diameter of 20cm is geometrically similar to a pump with 30 cm impeller diameter running at 950 rpm. The discharge of the large pump at the maximum efficiency was 200 litres/sec at a total head of 25 m. Determine the discharge and the head of the smaller pump at the maximum efficiency conditions. Also determine the ratio of power required. (14 Marks)

INDIAN MARITIME UNIVERSITY
(A CENTRAL UNIVERSITY, GOVT. OF INDIA)

SEMESTER- V, B.TECH. (MARINE ENGINEERING) – JUNE 2014 EXAMS

MARINE AUXILIARY MACHINES – I (T 1505)

(AY 2009-10 to 2012-13 batches only)

Time:- 3 Hrs
Date: 27.06.2014

Max Marks : 100
Pass Marks : 50

PART - A

(3 X10 = 30 Marks)

Compulsory Questions

1. a.) State why a positive displacement pump is fitted with a built in relief valve?
- b.) With reference to a Rudder, explain what is jumping clearance. Why is it important?
- c.) Sketch a Gate valve & identify parts.
- d.) Sketch a Fuel oil settling tank with all its mountings.
- e.) What are the statutory requirements for E.R. Bilges to be discharged from ship of 400 GRT & above?
- f.) Define a filter. Why filters are used on board a vessel?
- g.) What are the major causes of propeller shaft misalignment?
- h.) Explain function of gravity disc of a Centrifugal Purifier.
- i.) What is Emergency Bilge suction?
- j.) What are the advantages of plate type heat exchangers?

PART - B

(5 X14 = 70 Marks)

Answer Any Five of the following

2. Your vessel is in Dry-dock. Describe step by step, how would you remove the propeller for inspection & survey? What all special checks you will carry out before refitting it?

3. With the help of a simple sketch explain the operation of the hunting gear fitted for operating a 4 – Ram type electro hydraulic steering gear. Explain emergency steering gear.
4. Sketch & describe a two stage main air compressor fitted in a modern vessel. What are the safety fittings incorporated in it?
5. Sketch & describe a flash type fresh water generator installed in a modern vessel ? Describe how vacuum is generated?
6. With the help of a line diagram explain heavy fuel oil line diagram provided in a modern vessel. Show the bunkering connections & mention the safety precautions taken during bunkering.
7. Sketch & describe a centrifugal pump used for ballasting / de-ballasting. Describe regulations related to Ballasting / de-ballasting.
8. How a centrifugal purifier operates? Describe the role of conical discs fitted in it. Describe causes of overflow of a purifier and its remedies measure.

INDIAN MARITIME UNIVERSITY
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MARINE AUXILIARY MACHINES I
SEMESTER – V, B.TECH(MARINE ENGINEERING): DEC/JAN 2013-14
SUBJECT CODE: T 1505
(AY 2009-10 to 2012-13 batches only)

Date: 23.12.2013

Time: 3 Hrs
Maximum Marks:100
(Weightage 70%)

SECTION - A

(Question number 1 is compulsory. All question carry equal marks.) **(3 x 10=30)**

1. a) With the help of a simple sketch show the layout of the Engine Room of a foreign going vessel.
- b) With the help of a simple line diagram explain sanitary Water Hydrophore system fitted on board a vessel.
- c) Define a filter. Why it is used on board a vessel?
- d) Classify Marine pumps. State working principle of a centrifugal pump.
- e) What are the uses of compressed air on board a vessel? Name the Safety cut outs fitted on air compressors.
- f) With a simple sketch explain a conventional Lub oil cooler used for Main propulsion Engine.
- g) What is Marine pollution & what is the result of Marine pollution?
- h) Explain STOKES LAW & its application for purification of fuel oil.
- i) Explain two major causes of propeller shaft misalignment.
- j) Enumerate the list of underwater repairs carried out during the vessel's stay in a dry-dock.

SECTION – B

(Answer any five questions. All question carry equal marks.) **(5 x 14=70)**

2. Draw & describe the complete fuel oil line diagram along with Bunkering connections provided in it. What all safety precautions are taken during bunkering. Mention & justify the uses of various safety fittings provided in the bunkering system
3. Why a positive displacement pump is called a self priming pump? Sketch & describe a screw displacement or a gear type pump used for pumping oil fuel or lubricating oil on board a vessel. Explain why a built in relief valve is necessary in such pumps.

4. With the help of a block diagram explain how the compressed air is generated & distributed for various operations. What are the reasons for excess carbon deposits on the valves of a reciprocating main air compressor?
5. What are the different methods of generating fresh water on board a vessel? Draw & describe a low pressure boiling type fresh water Generator widely used in modern vessels. Mention step by step How would you start the apparatus.
6. State the principle of operation of a centrifugal purifier. With the help of a sketch explain the operation of a centrifugal purifier. How would you convert a purifier into a clarifier? Explain the role of a gravity disc.
7. Sketch & describe a 4-Ram type electro hydraulic steering gear used in large modern vessels. Explain how it operates. How the system is charged & purged ?
8. State the procedure adopted to remove the tail end shaft. State the check/tests needs to be carried out on tail end shaft during Survey. Mention what special checks you will carry out on Propeller key / keyway.

INDIAN MARITIME UNIVERSITY
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B.Tech (Marine Engineering) - Semester V
December 2015 Examinations

Computer Science
Subject Code:UG11T2205/UG11T1205

Time : 3 hrs
Date : 21.12.2015

Max Marks-100
Pass Marks-50

Part - A Compulsory Question

1.

10×3=30Marks

- a) Define a computer.
- b) Differentiate between data and information?
- c) Convert $(76)_8$ and $(A7)$ to equivalent binary number
- d) How is the 8421 code differs from the 4221 code.
- e) List few devices that can be used as primary.
- f) What is booting ?
- g) Define term network? Give its key advantage.
- h) What are header files? Why are they important?
- i) What will be output

```
Main()
{
    int arr[ ] = {1,2,3,4,5};
    int *ptr, i;
    ptr = arr + 4;
    for (i=4; i>=0; i- -)
        printf("\n %d", *(ptr - i));
}
```

- j) Explain the concept of making function call.

Part - B (5x14 = 70 Marks)

Answer any five from the following questions

2.

- a. With neat diagram explain DRAM.
- b. Subtract by 2's complement method i) 10101011 – 01111, 7
ii) 0111 – 10101011 iii) 1010101010 - 111101 7

3.

- a. Broadly classify computer based on their technology. 7
- b. Describe the OSI model in brief. 7

- 4.
- a. How an algorithm is useful in the context of software development? 7
 - b. Write an pseudo code to read the mark of 10 student. If mark is greater than 50, the student passes. Count the number of student passing. 7
- 5.
- a. Explain with suitable diagram simplex, half-duplex and full-duplex mode of data transmission 7
 - b. Discuss key network topology. 7
- 6
- a. Write a program to calculate sum of cubes of first n numbers. 7
 - b. What are decision control statement? Explain in detail with suitable example. 7
- 7.
- a. Write a program to read and display 'n' number using an array
 - b. Define a pointer in 'C' programming. What do you understand by void pointer. 9
5
- 8.
- a. What is advantage of using structure in 'C' programming 4
 - b. Write a 'C' program calculates the sum of two distances and displays it. 10
(Takes two distances in inch-feet system and stores in data members of two structure variables.)

INDIAN MARITIME UNIVERSITY
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May/ June 2017 End Semester Examinations
B. Tech (Marine Engineering – Fifth Semester)

Marine Boilers & Steam Engineering – UG11T 2402/UG11T 1402

Date: 13.06.2017
Time: 3 Hrs

Maximum Marks : 100
Pass Marks : 50

PART – A

(10 x 3 = 30 marks)

(All Questions are compulsory)

1. a) With the help of a neat sketch explain how smoke tubes are attached to tube sheet.
- b) List the functions of steam drum for a water tube boiler.
- c) Write a short note on water wall tubes.
- d) List out the primary functions of a condensing plant for a turbine and explain the reasons for maintaining high condenser vacuum.
- e) Smoke tube boilers are usually employed for low pressure applications. Explain the reasons for this limitation.
- f) Draw a neat sketch and explain the function of a "bridge gauge".
- g) List out the various causes for failure of refractory.
- h) Write a short note on LP steam turbine blade material selection criteria and typical blade material.
- i) Draw a neat sketch of a spring backed labyrinth glands.
- j) List down any five Non- Destructive tests carried out on boiler plates.

PART – B

(5 x 14 = 70 marks)

(Answer any 5 of the following)

2. (a) Explain the working of a double evaporation boiler with a neat sketch. (10 marks)
- (b) List out seven important boiler mountings and explain the function of air vents. (4 marks)

3. (a) Draw a sectional view of an ordinary plate type water level indicator and label the parts. (7 marks)
- (b) Sketch and explain the working of retractable soot blower. (7 marks)
- 4.(a) Explain the process of residual fuel oil burning in a furnace starting from atomisation to complete combustion. (7 marks)
- (b) Explain the turbine supporting arrangement and the function of sliding foot and panting plate. (7 marks)
- 5.(a) Write a short note on Hydraulic test of boilers. (7 marks)
- (b) Write a short note on Boiler tube failure including detection and rectification. (7 marks)
- 6.(a) List out various gear defects and explain Scuffing defect. (5 marks)
- (b) Sketch and describe a "three element feed water controller". (9 marks)
- 7.(a) Draw a typical single plane turbine plant with HP and LP turbine suitable for marine steam propulsion plant. Indicate the cross over pipe, astern turbine, condenser and the gear box. (7 marks)
- (b) List out the various internal losses in turbine and describe "Residual velocity loss" and "Gland leakage losses". (7 marks)
8. (a) List out various causes of loss or low vacuum in condenser. (4 marks)
- (b) Draw a typical impulse turbine blade indicating the "inverted T" root fixing arrangement, tenon and shroud band. (5 marks)
- (c) List out routine checks to be carried out and care to be taken to ensure proper lubrication of turbine bearings. (5 marks)

INDIAN MARITIME UNIVERSITY
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May/June 2016 End Semester Examinations
B.Tech. (Marine Engineering)

Fifth Semester – Marine Internal Combustion Engine- I (UG11 T1503/ T2503)

Date : 25.06.2016

Time: 3 Hrs

Max Marks : 100

Pass Marks: 50

Part-A

(3 x 10 = 30 Marks)

Compulsory Question

- 1) a) Why air cooler is used in Marine Diesel Engine?
- b) Illustrate three relative advantages of two stroke and four stroke type engines.
- c) Explain why bore cooling system is preferred in modern engines?.
- d) What are the constraints to increase the engine mean piston speed?
- e) How mist detectors become a safety device for a running diesel engine?
- f) Draw the heat Balance Diagram of a Diesel Engine.
- g) Draw timing diagram of a 2-Stroke Diesel Engine and name the processes of the complete cycle.
- h) Why tie rods are used for Marine Diesel Engines ?
- i) What are the various impurities generally found in Heavy Fuel oil used in large 2-stroke Diesel Engine. ?
- j) What are the various methods used for control of NOx emission in diesel engine.

Part-B

(14 x 5 =70 Marks)

Answer any Five Questions

- 2) Sketch and describe a constant pressure turbo charging system. Give its advantages and disadvantages. What is the maintenance required to maintain its efficiency?
(4+4+6 Marks)
- 3) Sketch a simple line diagram for a main engine Jacket cooling water system with auto temperature control.
Explain the maintenance require for a cooling unit. (10+4 Marks)
- 4) List the various factors which lead to Main engine start air line explosion. What are the indications prior to the explosion? What are the safety features incorporated in the system to avoid explosion. (4+4+6 Marks)
- 5) Sketch and describe a fuel supply system or a Diesel Engine showing all heaters, filters, pumps, venting system etc. Describe how oil temperature is controlled. (10+4 Marks)
- 6) What is “scavenging” in diesel engines? What are the different types of scavenging employed for marine diesel engines? Briefly explain two of those systems along with their merits and demerits. (3+4+7 Marks)

- 7) What is super charging for a modern two stroke engine? How is it done and what are the benefits? What maintenance need to be carried out and how it is done to keep the machinery efficient. (2+4+8 Marks)
- 8) What are the different types of heat exchangers used for marine machineries? Show the heat exchanger location in Main engine jacket cooling fresh water system along with the temperatures at terminal points. What are the materials used for construction of the heat exchanger. (2+8+4 Marks)



INDIAN MARITIME UNIVERSITY
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East Coast Road, Uthandi, Chennai-600 119.

B.Tech. (MARINE ENGINEERING)

December 2012 Examinations

FIFTH SEMESTER EXAMINATION

Marine Internal Combustion Engine -I

Old Sub Code: UG/ME/BS/T/313

QP Code: T0511503

Date: 24.12.12

Max Marks: 100

Time : 3 Hrs

PART A

(10x3=30Marks)

Answer all the Questions.

1. Answer the following with valid reasoning—
 - a) Why in a heat engine air cooler is used?
 - b) What is Tie rod, used in cross head, long stroke type engine and its purposes?
 - c) Why volumetric efficiency for a four stroke engine remains high when compared with two stroke engine.
 - d) Illustrate three relative advantages of two stroke and four stroke type engines.
 - e) Illustrate the Purpose of nozzle ring used in Turbo charger.
 - f) Explain why Supercharging system in long stroke crosshead type engine is provided.
 - g) How thermal efficiency of a marine plant is maximised although a diesel engine is inherently incapable of utilising all the heat generated in a cylinder?
 - h) What are the constraints to increase the engine mean piston speed?
 - i) Why marine engine exhaust gas emission is effectively controlled in all modern engines.
 - j) How mist detectors become a safety device for a running diesel engine?

PART B

Answer any five questions.

- 2) Draw a combustion characteristic curve of a slow speed diesel engine and explain the curve. (4+10 Marks)
- 3) The Gudgeon bearing assembly is not particularly suited for highly rated two stroke engine unless special arrangements are made for its lubrication. (14 Marks)
- 4) Draw a simple line sketch diagram of static components of a cross head type diesel engine. Show how all those components are fastened. Label all the components. (8+4+2 Marks)
- 5) Sketch and describe a constant pressure turbo charging system. Give its advantages and disadvantages. What is the maintenance required to maintain its efficiency? (4+4+6 Marks)
- 6) Discuss each of the following terms and explain its relevance to internal combustion
 - a) After burning of fuel in combustion chamber.
 - b) Compression ratio in diesel engine.
 - c) Fuel oil ignition delay.
 - d) Labyrinth seal.(3.5x4 Marks)
- 7) Sketch a simple line diagram for a main engine Jacket cooling water system with auto temperature control. Explain the maintenance required for a cooling unit. (10+4 Marks)
- 8) Define the causes of cylinder liner and piston rings wear? What maintenance needs to be carried out to avoid the wear out? Explain the possible consequences of operating a main engine with excessive wear. (4+4+6 Marks)
- 9) List the various factors which lead to Main engine start air line explosion. What are the indications prior to the explosion?

What are the safety features incorporated in the system to avoid explosion.

(4+4+6 Marks)

INDIAN MARITIME UNIVERSITY
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May/June 2016 End Semester Examinations
B.Tech. (Marine Engineering)

Fifth Semester – Management Science and Economics (UG11 T1502/ T2502)

Date : 24.06.2016

Max Marks: 100

Time: 3 Hrs

Pass Marks: 50

Part-A

(3 x 10 = 30 Marks)

Compulsory Question

- 1) (a) What are the functions of management?
- (b) Define Break-Even Point.
- (c) What is the difference between job evaluation and merit rating?
- (d) Explain Vroom's theory of motivation?
- (e) Define Productivity
- (f) What are the objectives of inventory control?
- (g) What is meant by elasticity of demand?
- (h) Explain the term inflation?
- (i) What are the functions of IMF?
- (j) What are the major sea ports in India?

Part-B

(14 x 5 =70 Marks)

Answer any Five Questions

- 2) Examine the essential characteristics of operations research in decision-making. (14)
- 3) Explain budgetary control? (14)
- 4) How is price determined under perfect competition? (14)
- 5) (a) Explain different types of organizations (10)
(b) Write a note on modern trends in organization structure designs (4)
- 6) (a) Explain with a neat sketch Break even analysis (10)
(b) What are the limitations of Break even analysis? (4)
- 7) (a) Write the differences between PERT & CPM (5)
(b) Write a short note on TQM (5)
(c) What are the factors of production? (4)
- 8) (a) Define elasticity of supply and explain various types of elasticity of supply (6)
(b) Explain cost- output relationship and cost curves in short period (8)

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INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

B.Tech. (Marine Engineering)
Semester – V – December 2015 End Semester Examinations

Management Science & Economics
Subject Code: UG11T2502/UG11T1502

Time: 3 Hours
Date: 10.12.2015

Max Marks: 100
Pass Marks: 50

Part-A
Compulsory Questions

(3x10=30 Marks)

1.
 - a) Explain the term inflation
 - b) What is cost push inflation
 - c) Explain SWAT Analyses
 - d) Explain any one of the motivational Theories
 - e) What are the objectives of inventory control
 - f) Explain the difference between preventive maintenance and condition based maintenance on board ships.
 - g) How does the fluctuation of exchange rates impact the exporters and importers
 - h) What are the functions of I. M. F.
 - i) What are the functions of W. T. O.
 - j) Which are the major sea ports in India

Part-B
Answer any five of the followings

(5x14 = 70 Marks)

2. Write short notes on different types of organisation structures.
3. What is HRD and what role does it play in a commercial organisation.
4. Explain CPM and PERT - Explain the differences.
5. Explain TQM and ISO 9000 series
6. What are the functions of Central Bank and commercial Banks
7. What is money and write short notes on the different types of money.
8. What is direct and indirect taxes, write short notes giving examples.
9. State the Law of Demand, its assumptions and the mathematical representation. Explain Veblen goods and Giffen goods.

2015



INDIAN MARITIME UNIVERSITY

B.Tech (MARINE ENGINEERING)

June 2013 Examinations

FIFTH SEMESTER

MANAGEMENT SCIENCE & ECONOMICS

Old Subject Code: UG/ME/MS/T/312

Date: 08.06.2013

Time: 3 Hrs

QP Code: T0511502
Max. Marks: 100

Note : (i) Non programmable scientific calculator is allowed

(ii) Question no 1 is compulsory

(10*3=30 MARKS)

PART A

ANSWER THE COMPULSARY QUESTION

1. (a) Write a short notes on directing
- (b) What are the elements of the working capital?
- (c) Define plant layout. What are the consequences of poor layout?
- (d) What are the objectives of inventory control?
- (e) Write short notes on MBO
- (f) What is meant by elasticity of demand?
- (g) Explain how to determine price under perfect competition
- (h) Explain the term inflation?
- (i) What are the functions of IMF?
- (j) What are the major sea ports in India?

INDIAN MARITIME UNIVERSITY
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December 2016 End Semester Examinations
B.Tech. (Marine Engineering) Fifth Semester

Management Science & Economics (UG11T1502/ UG11T2502)

Date : 17.12.2016

Time: 3 Hrs

Maximum Marks: 100

Pass Marks : 50

PART – A

(Compulsory Questions)

(10 x 3=30 Marks)

1. (a) What is Organizing ? Give an example.
- (b) What are the various ways of recruitment adopted by a firm?
- (c) Write a short note on profit and loss statement of a firm.
- (d) Write a short note on linear programming.
- (e) What are the objectives of Inventory Control ?
- (f) Define Price Elasticity of Demand.
- (g) Linear Homogenous Production Function . Explain.
- (h) $AR=MR=MC=AC$. Explain.
- (i) Sticky Price. Explain.
- (j) Define Monopoly.

PART – B

(Answer any FIVE of the following)

(5X14=70 Marks)

2. Explain the functions of Management.
3. Explain the Break-Even Analysis.
4. Explain SWOT Analysis.
5. How is CPM different from PERT?
6. Why does the demand curve slope downward ?
7. What are the methods of controlling inflation ?
8. How is price determined under perfect competition ?

INDIAN MARITIME UNIVERSITY
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MANAGEMENT SCIENCE & ECONOMICS
SEMESTER – V, B.TECH(MARINE ENGINEERING): DEC/JAN 2013-14
SUBJECT CODE: T 1502
(AY 2009-10 to 2012-13 batches only)

Date: 16.12.2013

Time: 3 Hrs
Maximum Marks:100
(Weightage 70%)

SECTION - A

Answer all questions

3 x 10 = 30 M

1. a) Briefly explain major functions of a manager.
- b) What is standard costing?
- c) Write a short note on linear programming.
- d) Explain Herzberg's theory of motivation.
- e) Explain with example the concept of MBO.
- f) Explain Law of variable proportions.
- g) Write a short note on Demand for money.
- h) How does the fluctuation in the exchange rate affect the exporters and importers of a country?

i) Write a brief note on functions of a port.

SECTION - B

Answer any five of the following questions

(5 X 14 = 70 Marks)

1. Define planning and describe various steps that a manager follows in planning process (10+4)
2. Explain the use of break even analysis in managerial decision making with the help of a diagram. (10+4)
3. Describe the concept of PERT with an example. How is it different from CPM? (10+4)
4. Explain Maslow's theory of Hierarchy of needs and McGregor's theory of X and Y. (10+4)
5. How the equilibrium price and output is arrived for a firm under perfect competition both in the short run and long run? (14)
6. Define price elasticity of demand. What are the determinants of price elasticity of demand? Differentiate between the following on the basis of elasticity of demand:
 - a. Superior good and Inferior good
 - b. Complements and substitutes. (3 + 7 + 4)
7. Elaborate the functions of Reserve Bank of India. (14)
8. Discuss the nature and scope of managerial economics (14)

INDIAN MARITIME UNIVERSITY
DEPARTMENT OF MARINE ENGINEERING
SEMESTER V – JULY 2012 EXAMINATION

T/315 MARINE AUXILIARY MACHINERY – I

TIME 3 HRS

MAX MARKS: 100

-
- Note:** (i) Non- programmable scientific calculator is allowed.
(ii) Attempt six questions.
(iii) Questions in Part ' A' is compulsory.
-

PART A

(10 × 3 = 30 Marks).

ANSWER ALL QUESTIONS

- 1.
- (a) Draw a neat sketch of engine room lay out of a cargo ship and mark location of different machineries.
 - (b) Explain the purpose of emergency bilge suction. Draw a sketch showing the position of emergency bilge suction.
 - (c) Name different types of pumps and their applications in marine systems.
 - (d) Name different types of filters used in on board marine systems.
 - (e) Explain the necessity of inter coolers and after coolers with respect to air compressors.
 - (f) Draw a propeller shafting system for power transmission from Engine to the propeller and mark all parts.
 - (g) Name various Annexes adopted under MARPOL 73/78.
 - (h) What is the full form of SOPEP? Name at least five items that the SOPEP locker must have.
 - (i) Name different types of valves used in marine systems. What is the purpose of an air vent in the system?
 - (j) What are the advantages and disadvantages of plate type heat exchangers?

PART B

(5 × 14 = 70).

ANSWER ANY FIVE QUESTIONS.

- 2. With respect to Annex I of MARPOL 73/78 convention, explain with a neat sketch, an equipment used for pumping out machinery space bilges.
- 3. Explain cavitation with respect to systems using centrifugal pumps. Sketch a centrifugal pump and name all parts.
- 4. Explain how pure water is produced from sea water using reverse osmosis Process.
- 5. a) Draw Heavy fuel oil and diesel oil bunkering pipe line. (10)
b) Describe the importance of pre-bunkering check list and the precautions to be taken prior to bunkering. (4)
- 6. a) Draw a sketch of Two Ram Hydraulic steering gear system and explain the working principle. (10)
b) Explain the purpose of relief valve in the system. (4)
- 7. Sketch and describe a two stage air compressor suitable for marine use up to 30 bar pressure.
- 8. With respect to Marpol Annex IV, describe with the aid of a sketch, a biological sewage treatment plant.

INDIAN MARITIME UNIVERSITY
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May/June 2016 End Semester Examinations
B.Tech. (Marine Engineering)

Fifth Semester – Material Science (UG11 T1501/ T2501)

Date : 23.06.2016
Time: 3 Hrs

Maximum Marks: 100
Pass Marks : 50

Part-A
Compulsory Question

(3 x 10 = 30 Marks)

- 1) a) Explain briefly the term “Ionization Potential”.
- b) What is the basic difference between “Cast Iron” and “Steel”?
- c) What is the function of a “Sacrificial Anode”?
- d) State Pauli's exclusion law of principle with an example?
- e) Give any five destructive tests for material testing's?
- f) State Gibb's Phase rule?
- g) What are inter metallic compounds?
- h) What are the objectives of heat treatment?
- i) Define fatigue?
- j) Explain the pilling Bedworth rule with suitable example?

Part-B
Answer any Five Questions

(14 x 5 =70 Marks)

- 2) Use two labelled sketches to show schematically the differences between (a) The bonding of atoms in a solid metal such as Sodium, and (b) The bonding of atoms in solid nonmetal such as Sodium Chloride. (14)
- 3) Explain the process of failure of a material due of fatigue and show what appearances the fractured surfaces may have. (14)
- 4) Discuss the different means to control and prevent corrosion in materials. (14)
- 5) Discuss the materials to be selected for manufacture of the following components with their approximate compositions: (14)
 - (a) Stern Frame
 - (b) Engine crankshaft
 - (c) Diesel Engine Cylinder cover
 - (d) Diesel Engine Cylinder Liner
- 6) Explain the iron –carbon equilibrium diagram. (14)
- 7) a. Define the term creep? Explain the various types of creep with suitable diagram? (8)
b. Explain the fatigue testing machine with a suitable diagram. (6)
- 8) a. What are the applications of chromium, titanium in ship board systems? (7)
b. What are refractories? Explain various types and their uses? (7)

**INDIAN MARITIME UNIVERSITY
DEPARTMENT OF MARINE ENGINEERING
SEMESTER V – JULY 2012 EXAMINATION
T/311 MATERIAL SCIENCE**

Time: 3 HRS

MAX MARKS: 100

Note: (i) Non- programmable scientific calculator is allowed.

(ii) Attempt six questions

(iii) Question no. 1 is compulsory

PART A

(1×30=30 MARKS)

ANSWER THE COMPULSARY QUESTION

1.
 - a) Explain coordination number and atomic power factor. (3)
 - b) What are amorphous materials? (3)
 - c) Why ferrous alloys are used extensively as engineering materials? (3)
 - d) What is hardness? What are the common hardness tests? (3)
 - e) What is a solid solution? (3)
 - f) Explain isothermal transformation diagram. (3)
 - g) What is a solution heat treatment? (3)
 - h) Define fatigue. What are the factors affecting fatigue? (3)
 - i) What is hydrogen embrittlement? (3)
 - j) Mention the application of PVC in shipping systems. (3)

PART B

(5×14=70 MARKS)

ANSWER ANY FIVE QUESTIONS

2. a) Briefly cite the main differences between ionic, covalent, and metallic bonding. (12)
- b) State the Pauli exclusion principle. (2)
3. Name the five cast iron types and, for each, describe its microstructure and note its general mechanical characteristics. (14)
4. Draw and explain iron carbide equilibrium diagram and mark on it all salient temperature and composition fields? (14)
5. State the purposes of and describe procedures for the following heat treatments: process annealing, stress relief annealing, normalizing, full annealing, and spheroidizing. (14)
6. Define creep and explain the conditions under which it occurs. (14)
7. Briefly discuss common types of corrosion that are encountered on metal in different situation. (14)
8. Write short notes on PTFE and its properties? Briefly mention its applications in shipping systems. (14)

INDIAN MARITIME UNIVERSITY
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B.Tech. (Marine Engineering)
Semester – V – December 2015 End Semester Examinations

Management Science & Economics
Subject Code: UG11T2502/UG11T1502

Time: 3 Hours
Date: 10.12.2015

Max Marks: 100
Pass Marks: 50

Part-A
Compulsory Questions

(3x10=30 Marks)

1.
 - a) Explain the term inflation
 - b) What is cost push inflation
 - c) Explain SWAT Analyses
 - d) Explain any one of the motivational Theories
 - e) What are the objectives of inventory control
 - f) Explain the difference between preventive maintenance and condition based maintenance on board ships.
 - g) How does the fluctuation of exchange rates impact the exporters and importers
 - h) What are the functions of I. M. F.
 - i) What are the functions of W. T. O.
 - j) Which are the major sea ports in India

Part-B

(5x14 = 70 Marks)

Answer any five of the followings

2. Write short notes on different types of organisation structures.
3. What is HRD and what role does it play in a commercial organisation.
4. Explain CPM and PERT - Explain the differences.
5. Explain TQM and ISO 9000 series
6. What are the functions of Central Bank and commercial Banks
7. What is money and write short notes on the different types of money.
8. What is direct and indirect taxes, write short notes giving examples.
9. State the Law of Demand, its assumptions and the mathematical representation. Explain Veblen goods and Giffen goods.

INDIAN MARITIME UNIVERSITY
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MARINE INTERNAL COMBUSTION ENGINE I
SEMESTER – V, B.TECH(MARINE ENGINEERING): DEC/JAN 2013-14
SUBJECT CODE: T 1503
(AY 2009-10 to 2012-13 batches only)

Date: 18.12.2013

Time: 3 Hrs
Maximum Marks:100
(Weightage 70%)

- Note : i) Use of Non programmable scientific calculator is allowed.
ii) Attempt six questions.
iii) Question in SECTION- A is compulsory.

SECTION - A

Question No. 1 is compulsory

10 x 3 = 30 M

1. a) Draw timing diagram of a 2-Stroke Diesel Engine and name the processes of the complete cycle.
b) Briefly explain the terms : Mean Piston speed, M.C.R and Ignition delay .
c) Why tie rods are used for diesel engines ?
d) Name various types of scavenging system used for Marine Diesel Engine name the best type with justification.
e) What are the various impurities generally found in Heavy Fuel oil used in large 2-stroke Diesel Engine. ?
f) What are the various methods used for control of NOx in diesel engine .
g) Justify the cooling medium you would use for cooling of 2-stroke X-hdtype piston.
h) Explain briefly , how severity of crankcase explosion in diesel engine is reduced.
i) Briefly explain heat treatment methods used for Crankshaft.
j) Prepare a list of factors that influence combustion in diesel engine .

SECTION - B

Answer any five from the following:

(5 x 14 = 70)

2. a) Why is it difficult to lubricate X-hd bearing of a diesel engine .
b) Explain at least two methods which are in use to overcome this problem
(4 + 5 + 5)
3. a) Draw a neat sketch of Cylinder Liner of large 2-Stroke Marine Diesel Engine of any reputed manufacturer where bore cooling method is used. Label the sketch and brief describe including the special features of the liner.
b) Show all sealing areas on the liner and explain the sealing method & material.
c) What is the quality of finish provided to the liner surface and how is it achieved ?
(8 + 3 + 3)

4. a) Why supercharging of a diesel engine is done ?
- b) Name various methods of turbocharging used for diesel engines and give a comparative study of them ?
- c) Why scavenge air coolers are fitted in Diesel Engine? What are the consequences of inefficient cooling?
- (2 + 8 + 4)
5. a) Name three grades of fuel oil generally used on board ships and specify place of use.
- b) Explain the terms: atomisation, penetration, turbulence and their effect on combustion
- c) What is flash point , ignition point ?
- d) Explain the treatment of HFO (starting from DB tank) for burning in the engine.
- (3 + 3 + 2 + 6)
6. a) Explain the process of Starting Air line explosion.
- b) How such explosion is prevented ?
- c) How air starting line is protected from damage due to explosion ?
- d) How will you detect leakage in cylinder air starting valve ?
- (7 + 2 + 3 + 2)
7. a) Draw and label a sketch of two piece piston of a medium speed engine?
Why the piston is made in two pieces ?
- b) With the help of simple line sketch explain three methods of cooling trunk type pistons.
- c) With help of sketch, describe three different types of piston rings.
Make mention of their special features.
- (8 + 3 + 3)
8. a) What is surging of turbocharger?
- b) How surging of turbocharger is prevented ?
- c) Describe various routine maintenance work necessary for efficient operation of main engine turbocharger?
- (4+5+5)
9. Elaborate the steps taken by designers during last 40 years to improve the fuel efficiency of Marine Diesel Engines and reduction of environmental pollution. (14)

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INDIAN MARITIME UNIVERSITY

B.Tech (MARINE ENGINEERING)

June 2013 Examinations

FIFTH SEMESTER

FLUID MECHANICS II

Old Subject Code: UG/ME/BS/T/314

Date: 15.06.2013

Time: 3 Hrs

QP Code: T0511504

Max. Marks: 100

Note: (i) Non – programmable scientific calculator is allowed.

(ii) Attempt six questions.

(iii) Question no. 1 (Part A) is compulsory. Answer any five from Part B

Part A

(3×10 marks)

Compulsory Question.

1. (a) Explain Dynamic Similarity.
- (b) Define Indicator Diagram for a reciprocating pump.
- (c) Indicate criteria for limiting the maximum speed of a reciprocating pump.
- (d) Indicate classifications of a reciprocating pump.
- (e) Define – Suction head, Delivery head, Static head and Manometric Head of a centrifugal pump.
- (f) Differentiate between Volute casing and Vortex casing.
- (g) Define specific speed of a centrifugal pump.
- (h) Define – Gross Head, Net Head and name the important efficiencies of a turbine.
- (i) What data are required to be determined for design of a Pelton Wheel?
- (j) Explain the uses of Draft Tube in a reaction turbine.

PART B

ANSWER ANY FIVE QUESTION

2. (a) Find expression for Discharge and Work done for a reciprocating pump. (6M)
- (b) A double acting reciprocating pump, running at 40 r.p.m., is discharging 1.0 m^3 of water per minute. The pump has a stroke of 400 mm. The diameter of the piston is 200 mm. The delivery and suction head are 20 m and 5 m respectively. Find the slip of the pump and power required to drive the pump. (8M)
3. The diameter and stroke length of a single acting reciprocating pump are 12 cm and 20 cm respectively. The length of suction and delivery pipes are 8 m and 25 m respectively and their diameters are 7.5 cm. If the pump is running at 40 r.p.m., and suction and delivery heads are 4 m and 14 m respectively, find the pressure head in the cylinder:
- At the beginning of the suction and delivery stroke,
 - In the middle of suction and delivery stroke, and
 - At the end of the suction and delivery stroke.

Take atmospheric pressure head = 10.30 m of water and $f = 0.009$ for both pipes. (14M)

4. (a) A centrifugal pump is required to discharge $0.118 \text{ m}^3/\text{s}$ at a speed of 1450 r.p.m. against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and Manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. (7M)
- (b) Find the power required to drive a centrifugal pump which delivers $0.04 \text{ m}^3/\text{s}$ of water to a height of 20 m through a 15 cm diameter pipe and 100 m long. The overall efficiency of the pump is 70% and co-efficient of friction, $f = 0.15$ in the formula $h_f = 4fLV^2 / (d \times 2g)$. (7M)

5. (a) Define following dimensionless numbers:
- Reynolds's Number (ii) Froude's Number (ii) Euler's Number (6M)
- (b) The frictional Torque T of a disc of diameter D rotating at a speed of N in a fluid of Viscosity μ and density ρ in a turbulent flow is given as $T = D^5 N^2 \rho \Phi (\mu / D^2 N \rho)$. Prove this by method of dimensions. (8M)

6. The outer diameter of an impeller of a centrifugal pump is 400 mm and outlet width is 50 mm. The pump is running at 800 rpm and is working against a total head of 15 m. The vanes angle at outlet is 40° and Manometric efficiency is 75%. Determine:

- (i) Velocity of flow at outlet,
- (ii) Velocity of water leaving the vane,
- (iii) Angle made by the absolute velocity at outlet with the direction of motion at outlet,
- (iv) Discharge.

(14 M)

7. (a) A Pelton wheel is to be designed for the following specifications: (7M)

Shaft Power = 11,772 kW; Head = 380 m; Speed = 750 rpm; Overall Efficiency = 86%; Jet diameter is not to exceed one sixth of the wheel diameter. Determine:

- (i) The wheel diameter, (ii) The number of jets required, and (iii) Diameter of the jet.

Take $K_{v1} = 0.985$ and $K_{u1} = 0.45$

(b) Two jets strike the buckets of a Pelton wheel, which is having shaft power as 15450 kW. The diameter of each jet is given as 200 mm. If the net head on the turbine is 400 m, find the overall efficiency of the turbine. Take $C_v = 1.0$. (7M)

8. The water available for a Pelton wheel is 4 cumec and the total head from the reservoir to the nozzle is 250 m. The turbine has two runners with two jets per runner. All the four jets have the same diameters. The pipe line is 3000 m long. The efficiency of power transmission through the pipe line and the nozzle is 91% and efficiency of each runner is 90%. The velocity co-efficient of each nozzle is 0.975 and co-efficient of friction '4f' for the pipe is 0.0045.

Determine: (i) The power developed by the turbine, (ii) the diameter of the jet, and (iii) The diameter of the pipe line.

(14 M)



INDIAN MARITIME UNIVERSITY

B.Tech (MARINE ENGINEERING)

June 2013 Examinations

SECOND SEMESTER

APPLIED THERMODYNAMICS I

Old Subject Code: UG/ME/BS/T/123

Date: 12.06.2013

Time: 3 Hrs

QP Code: T0511203

Max. Marks: 100

Part - A

(3x10=30 marks)

Compulsory question

- 1) (a) Define second law of thermodynamics
- (b) Explain Carnot's principle
- (c) Define isentropic efficiency
- (d) Define work ratio
- (e) Write equation for mean effective pressure
- (f) Define free air delivered
- (g) What is mean by inter cooling
- (h) Explain air motor
- (i) Define specific humidity
- (j) Explain Dalton's law of partial pressure

Part -B

(5x14=70 Marks)

Answer any five of the following

- 2) (a) 1kg of steam at 7bar, entropy 6.5 k j/kg k, is heated reversibly at constant pressure until the temperature is 250⁰c. calculate the heat supplied, and show on a T-S diagram the area which represents the heat flow.
- (b) Dry saturated steam at 100bar expands isothermally and reversibly to a pressure of 10 bar. Calculate the heat supplied and the work done per kilogram of steam during the process.

- 3) (a) Explain Rankine cycle
- (b) A steam power plant operates between a boiler pressure of 42 bar and a condenser pressure of 0.035 bar calculate for these limits the cycle efficiency, the work ratio and the specific steam consumption (i) For a Carnot cycle using wet steam(ii) For a rankine cycle with dry saturated steam at entry of the turbine (iii) For the rankine cycle, when the expansion process has an isentropic efficiency of 80%
- 4) (a) Explain steam engine plant
- (b) Steam at 15 bar pressure and dry is supplied to two locomotive double acting steam engines. The driving wheels are 2m in diameter. The stroke of the engine is 60cm. The tractive effort at 40km/hr speed is 40kn. The cut off is at 50% of the stroke at the given speed. Assume mechanical efficiency of 80% and diagram factor 0.65. The exhaust pressure is 1.0bar. Find the diameter of the engine cylinder.
- 5) (a) Explain multistage compressor with neat sketch
- (b) A single stage reciprocating compressor takes 1 m^3 of air per minute at 1.013 bar and 15°C delivers it at 7 bar. Assuming that the law of compression is $p v^{1.35} = \text{constant}$, and that clearance is negligible. Calculate the indicated power.
- 6) (a) Write down the uses of compressed air
- (b) A single stage double acting air compressor has a FAD of $14\text{ m}^3/\text{min}$ measured at 1.013 bar and 15°C the pressure and temperature in the cylinder during induction are 0.95 bar and 32°C . The delivery pressure is 7 bar and the index of compression and expansion, $n=1.3$. calculate the indicated power required and the volumetric efficiency. The clearance volume is 5% of the swept volume.
- 7) (a) A vessel of volume 0.4 m^3 contains 0.45kg of carbon monoxide and 1kg of air at 15°C . Calculate the partial pressure of each constituent and the total pressure in the vessel. The gravimetric analysis of air is to be taken as 23.3% oxygen and 76.7% nitrogen. Take the molar masses of carbon monoxide, oxygen and nitrogen as 28,32 and 28kg/k mol .
- (b) Explain density, specific volume ,specific heat.
- 8) (a) Sketch and explain principle of cooling tower.
- (b) Explain steam condenser.



INDIAN MARITIME UNIVERSITY
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B.Tech. (MARINE ENGINEERING)

December 2012 Examinations

FIFTH SEMESTER EXAMINATION

Fluid Mechanics - II

Old Sub Code: UG/ME/BS/T/314

QP Code: T0511504

Date: 28.12.12

Max Marks: 100
Time : 3 Hrs

-
- Note:* (i) *Non-programmable scientific calculator is allowed.*
(ii) *Attempt six questions*
(iii) *Question no. 1 is compulsory*
-

PART A

(10*3= 30 Marks)

ANSWER THE COMPULSORY QUESTION

- 1) (a) State the need for Dimensionless Co-efficient?
(b) Define slip, percentage slip and negative slip of a reciprocating pump.
(c) What is an air vessel? Describe the function of the air vessel for reciprocating pumps.
(d) Classify reciprocating pumps.
(e) Define manometric efficiency and mechanical efficiency of centrifugal pump.
(f) What is priming? Why is it necessary?
(g) What is NPSH?
(h) What are hydraulic machines?
(i) Differentiate between impulse and reaction turbines with examples.
(j) Define the term governing of a turbine.

INDIAN MARITIME UNIVERSITY
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December 2016 End Semester Examinations
B.Tech. (Marine Engineering) Fifth Semester

Marine Auxiliary Machines- I (UG11T1505/ UG11T2505)

Date : 26.12.2016

Time: 3 Hrs

Maximum Marks: 100

Pass Marks : 50

Note:- (i) Section – A is compulsory
(ii) Answer any five from Section – B

SECTION – A
(Compulsory Question)

(10 x 3 = 30 Marks)

1.

- a) Why is a Relief Valve fitted on the discharge side of a positive displacement pump?.
- b) Explain the purpose of emergency bilge suction.
- c) Explain briefly the effect of cavitation in centrifugal pumps.
- d) Name different types of filters used on board ships.
- e) What are the uses of compressed air on board a ship?
- f) What are the advantages and disadvantages of plate type heat exchangers?.
- g) What is the full form of SOPEP? Name at least five items that the SOPEP locker must have.
- h) State the purpose of Gravity Disc in a centrifugal separator.
- i) What do you mean by Propeller Drop.
- j) Name some of the machineries that are located in the Engine Room Bottom Platform

SECTION – B
(Answer any 5 Questions)

(5 x 14 = 70 Marks)

2. With a neat sketch explain an Impressed Current Cathodic Protection System fitted onboard ship (14 marks)
3. With the aid of a sketch explain a biological sewage treatment plant. (14 marks)

4. a) With the help of a neat diagram explain the working of two stage reciprocating air compressor (10 marks)
- b) Name the safety devices are associated with this type of compressor and it's function (4 marks)
5. Explain a Reverse Osmosis Plant used to produce Fresh Water (14 marks)
6. Explain OWS with a neat sketch (14 marks)
7. a) Draw a sketch of Two Ram Hydraulic steering gear system and explain the working principle. (10 marks)
- b) Explain requirement of hunting gear in steering gear system. (4 marks)
8. Explain the working of a centrifugal pump with a simple diagram. (14 marks)



INDIAN MARITIME UNIVERSITY
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East Coast Road, Uthandi, Chennai-600 119.

B.Tech. (MARINE ENGINEERING)

December 2012 Examinations

FIFTH SEMESTER EXAMINATION

Fluid Mechanics - II

Old Sub Code: UG/ME/BS/T/314

QP Code: T0511504

Date: 28.12.12

Max Marks: 100
Time : 3 Hrs

-
- Note:* (i) *Non-programmable scientific calculator is allowed.*
(ii) *Attempt six questions*
(iii) *Question no. 1 is compulsory*
-

PART A

(10*3= 30 Marks)

ANSWER THE COMPULSORY QUESTION

- 1) (a) State the need for Dimensionless Co-efficient?
(b) Define slip, percentage slip and negative slip of a reciprocating pump.
(c) What is an air vessel? Describe the function of the air vessel for reciprocating pumps.
(d) Classify reciprocating pumps.
(e) Define manometric efficiency and mechanical efficiency of centrifugal pump.
(f) What is priming? Why is it necessary?
(g) What is NPSH?
(h) What are hydraulic machines?
(i) Differentiate between impulse and reaction turbines with examples.
(j) Define the term governing of a turbine.

PART B

(5x14=70 Marks)

ANSWER ANY FIVE OUT OF SEVEN QUESTIONS

- 2) (a) A centrifugal pump, impeller diameter 0.50m, when running at 750 rev min⁻¹ gave on test the following performance characteristics:

Q (m ³ min ⁻¹)	0	7	14	21	28	35	42	49	56
H (m)	40.0	40.6	40.4	39.3	38.0	33.6	25.6	14.5	0
η (per cent)	0	41	60	74	83	83	74	51	0

Predict the performance of a geometrically similar pump of 0.35 m diameter and running at 1450 rev min⁻¹. Plot both sets of characteristics. (14 Marks)

- 3) (a) What is a reciprocating pump? Describe the principle and working of a reciprocating pump with a neat sketch.

(b) A single acting reciprocating pump, running at 50 rpm, delivers 0.1 m³/s of water. The diameter of the piston is 200 mm and stroke length 400 mm.

Determine:

- (i) The theoretical discharge of the pump.
- (ii) Coefficient of discharge, and
- (iii) Slip and percentage slip of the pump.

(7+7 Marks)

- 4) (a) Define an indicator diagram.

(b) A single acting reciprocating pump has piston diameter 12.5 cm and stroke length 30 cm. The centre of the pump is 4 m above the water level in the sump. The diameter and length of the suction pipe of the are 7.5 and 7 m respectively. The separation occurs if the absolute head in the cylinder during suction stroke falls below 205 m of water. Calculate the maximum speed at which the pump can run without separation. Take atmospheric pressure head = 10.3 m of water.

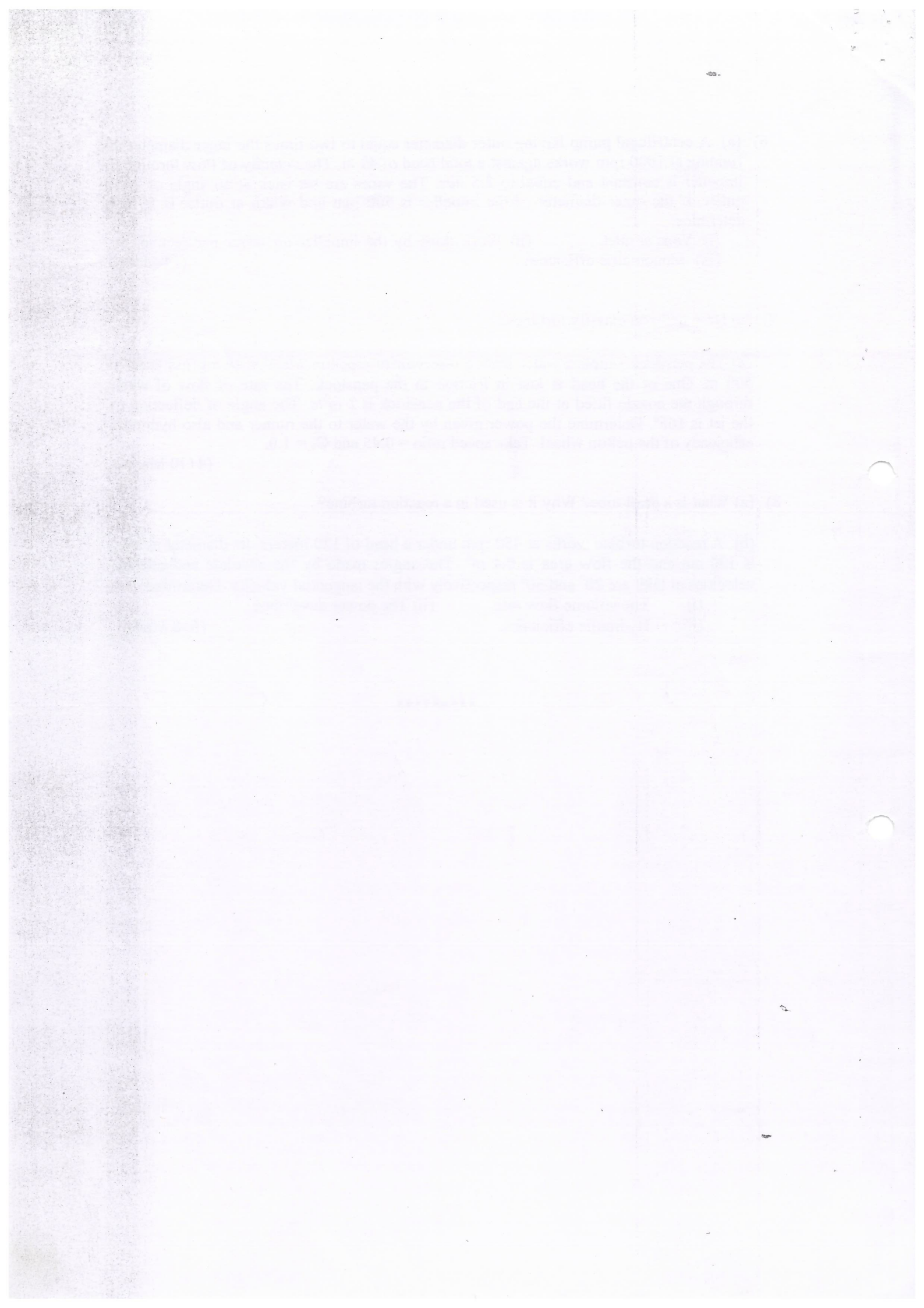
(4+10 Marks)

- 5) (a) What is cavitation and what are its causes? How will you prevent the cavitation in hydraulic machines?

(b) The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 rpm. The Vane angles of the impeller at outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.

(6+8 Marks)

- 6) (a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, determine:
- (i) Vane at inlet,
 - (ii) Work done by the impeller on water per second, and
 - (iii) Manometric efficiency. (14 Marks)
- 7) (a) How will you classify turbines?
- (b) The penstock supplies water from a reservoir to a pelton wheel with a gross head of 500 m. One of the head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is $2 \text{ m}^3/\text{s}$. The angle of deflection of the jet is 165° . Determine the power given by the water to the runner and also hydraulic efficiency of the pelton wheel. Take speed ratio = 0.45 and $C_v = 1.0$. (4+10 Marks)
- 8) (a) What is a draft tube? Why it is used in a reaction turbine?
- (b) A reaction turbine works at 450 rpm under a head of 120 meters. Its diameter at inlet is 120 cm and the flow area is 0.4 m^2 . The angles made by the absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Determine:
- (i) The volume flow rate,
 - (ii) The power developed
 - (iii) Hydraulic efficiency. (6+8 Marks)



INDIAN MARITIME UNIVERSITY
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End Semester Examination December 2017

Programme: B.Tech (Marine Engineering)

Semester: V

Subject Name: Marine Internal Combustion Engine-I

Subject Code: UG11T2503/1503

Date: 08.12.2017

Maximum Marks: 100

Time: 3 Hours

Pass Marks: 50

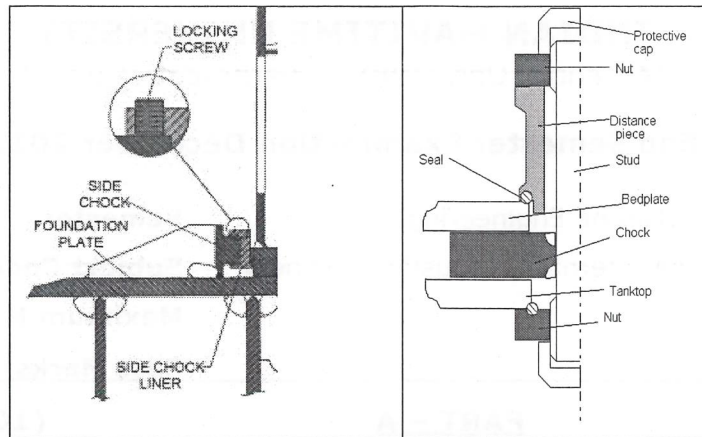
PART – A (10 X 3=30 Marks)
(All questions are compulsory)

- Q.1. a. Draw labelled timing diagrams of a two stroke and a four stroke marine diesel engine.
- b. Why are scavenging ports bored obliquely and how is the same effect achieved in four stroke engines.
- c. State the need of an auxiliary blower for constant pressure turbocharged engine.
- d. Draw a labelled PØ (pressure vs crank angle) diagram of a two stroke marine diesel engine clearly highlighting the compression phase, ignition delay period, uncontrolled combustion phase, controlled combustion phase, afterburning period and expansion. Assume the start of injection at 14 degrees before TDC and end of injection at 14 degrees after TDC.
- e. State mathematically the benefit of using a charge air cooler between the turbocharger and scavenge manifold.
- f. State the advantages of oil cooling over, water cooling in large two stroke piston cooling system
- g. State the reason for using fitted bolts to bolt the entablature, A frames and Bedplate together.
- h. State the parameters which govern the atomisation and penetration to achieve effective combustion.
- i. Justify the advantage of long stroke marine engine.
- j. Justify the statement "Turbochargers are matched to the engine".

PART – B (5 X 14=70 Marks)

Answer any 5 of the following seven questions

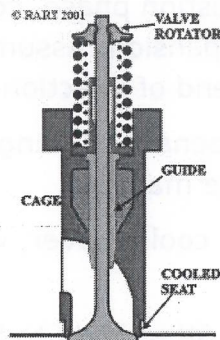
- Q.2. With respect to the diagrams shown below, answer the related questions.



- a. What do the two pictures represent? Answer in three lines. [2]
- b. What is the material of the chock and stud? [2]
- c. Justify and state reasons for introducing a distant piece as shown in the diagram. [4]
- d. State the purpose of chock. [2]
- e. Why are side chocks fitted and what are end chocks for? [2]
- f. Justify the use of side stays for an engine. [2]

Q.3.a. What are the measurements carried out on a piston of large two stroke engine during O'haul? [2]

b. Wrt to the diagram shown below answer the following questions:



- i. State benefit of having a valve rotator. [1.5]
- ii. State the purpose of using two co-axial springs and the how are the springs oriented and why? [3]
- iii. What are the advantages of a cooled seat? [1.5]
- iv. What is the material of exhaust valves and their seats? [1.5]
- v. What is tappet clearance and state the reason for clearance. [1.5]
- vi. What is the advantage of a hydraulically operated exhaust valve over rocker arm operated ones. [1.5]
- vii. State the purpose of valve guide. [1.5]

4. a. With respect to a starting airline explosion explain the following?

- i) How it can occur? [3]
- ii) How its occurrence can be minimized? [3]

- b. Sketch any fire smothering system is arrangement for extinguishing scavenge fire? [4]
- c. Explain the action to be taken in case an oil mist detector alarm is sounded? [4]
5. a. State the advantages of turbo charging an engine. [3.5]
- b. With the help of suitable simple schematic sketches elaborate the function of each of the following parts of a turbocharger? [7 X 1.5]
- i. Air filter unit of compressor
 - ii. Nozzle Ring
 - iii. Diffuser blades
 - iv. Volute casing
 - v. Labyrinth seal
 - vi. Inducer
 - vii. Turbine Blades with its attachment to the rotor.
6. With respect to the cooling systems employed in diesel engines answer the following questions:
- a. Why is fresh water used for cooling the engine parts, even though sea water is abundantly available? [3]
 - b. Draw simplified labelled line diagram of a fresh water jacket cooling system of an engine. [6]
 - c. State the reasons for additives periodically introduced into the cooling system. [2]
 - d. State the reason for using tangential bore cooling system in liners of diesel engines. [3]
7. a. Draw a labelled Sankey diagram for typical Marine two stroke diesel engine clearly indicating in percentage the power developed, lost and available. [5]
- b. Define the following terms with respect to a marine propulsion engine:
- i. Maximum continuous rating [3]
 - ii. Mean piston speed [3]
 - iii. Overload rating [3]
8. Write short notes on the following:
- i. Choice of marine diesel engines for propulsion. [4]
 - ii. Constant and Pulse type of Turbo-charging system [5]
 - iii. NOx and SOx controlling measures in diesel engines [5]

INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

May/ June 2017 End Semester Examinations

B.Tech. (Marine Engineering) Third Semester

(AY 2009-2014 batches)

Electronics (UG11T1302/ UG11T2302)

Date : 29.06.2017

Maximum Marks: 100

Time: 3 Hrs

Pass Marks : 50

PART – A

10X3=30 Marks

(All questions are compulsory)

1. (a) Describe the operation of *J-K Flip-Flop* with suitable truth table?
- (b) With neat circuit diagram explain the working of *Peak Detector using OPAMP*
- (c) What is ALU ?
- (d) Convert following *Binary Number* to *Gray Code*, 1) 1110, 2) 1011.
- (e) Which of the following is current controlled devices
(1) Triode (2) UJT (3) MOSFET (4) JFET
- (f) Solve the following *K-Map* to get solution in *SOP* form

	yz	00	01	11	01
wx	00	1	1	X	1
	01	1	1	1	0
	11	1	0	0	1
	01	0	0	1	1

(g) The following relationship between α and β are correct except

(1) $1-\alpha = \frac{1}{1+\beta}$ (2) $\alpha = \frac{\beta}{1+\beta}$ (3) $\beta = \frac{\alpha}{1-\alpha}$ (4) $\alpha = \frac{\beta}{1-\beta}$

(h) Draw block diagram of *CRO*

(i) Discuss the effect of negative and positive feedback.

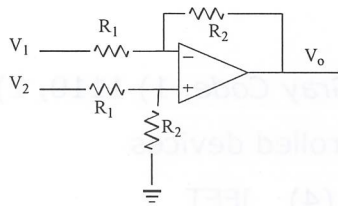
(j) Which signal (modulating or carrier signal) should keep higher in case of amplitude modulation and why?

PART – B

5X14=70 Marks

(Answer any 5 of the following)

2. (a) Realize a BCD Adder circuit and explain its operation (7 Marks)
- (b) Describe 4-bit up counter with suitable circuit diagram and state diagram. (7 Marks)
- 3.(a) A CE transistor amplifier, the load resistance in the collector circuit is $4K \Omega$ and $V_{cc} = 12 V$. find the coordinates of the operating point if the zero signal base current is $20 \mu A$ and $\beta = 100$. (7 Marks)
- (b) Draw and explain RC Coupled Amplifier. If a two stage cascade amplifier having gain of A_{v1} and A_{v2} respectively. What will be it's total gain (7 Marks)
4. (a) Find the output voltage V_o of the circuit shown below.



- (7 Marks)
- (b) What is *Input Offset Current* and how effect of *Input offset current* is compensated in OPAMP? (7 Marks)
5. (a) Draw and explain "DC Load Line", what are it's utilities. (7 Marks)
- (b) Proved that for a FET amplification factor $\mu = g_m \times r_d$, where g_m is the trans-conductance and r_d is the drain resistance. (7 Marks)
- 6.(a) Prove that, voltage gain of a feedback amplifier is and study the cases for Positive and Negative feedback.

$$A_{VF} = \frac{A_v}{1 - \beta A_v}$$

Where A_v is the amplifier gain and β is the feedback fraction (7 Marks)

- (b) Explain Bark-Hausen criterion for oscillations and explain how CRO used for measuring frequencies. (7 Marks)

7. a) Show that the Poisson's distribution is a limiting case of binomial distribution
When n is very large and p is very small in such a way that $np \rightarrow \lambda$.

b) Out of 800 families with five children each, how many families would be expected to have
 i) three boys and two girls (ii) two boys and three girls
 iii) at the most two girls, under the assumption that the probabilities for boys and girls are equal.

(6+8)

8. a) Derive the recurring relation for the moments of binomial distribution

$$\mu_{r+1} = pq \left[nr\mu_{r-1} + \frac{d\mu_r}{dp} \right] \text{ where symbols have their usual meanings.}$$

b) Use method of undetermined coefficients to solve the differential equation

$$\frac{d^2u}{dx^2} + 4u = 2 \sin 2x \quad (7+7)$$

9. a) The Fourier series $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$ is not always convergent. Write down the conditions (Dirichlet's) of a convergent Fourier series. If $f(x)$ is discontinuous at $x = c$, what value of the function should be used at the point of discontinuity, for all practical purpose.

b) Calculate the Laplace transform of the periodic function

$$f(t) = \begin{cases} A, & 0 < t < a \\ -A, & a < t < 2a \end{cases}$$

where A is a constant and $f(t) = f(t+2a)$.

(6+8)
