

INDIAN MARITIME UNIVERSITY

June 2022 End Semester Examinations

B.TECH(ME) UG11T3607 MARINE STEAM ENGINEERING

Duration -3 hrs

Max marks – 70

Pass Marks -35

Date – 10.06.2022

**Part A**

1. Multiple Choice Questions 10 MCQs ( 10 x 1 marks)

Sl. no	Question	Option A	Option B	Option C	Option D
(I)	Which of the following is true for a Regenerative feed heating cycle for a given steam inlet condition	Dryness fraction at the end of expansion process decreases	Dryness fraction at the end of expansion process is unchanged	Dryness fraction at the end of expansion process increases	Dryness fraction at the end of expansion process varies
(II)	Main Steam pressure and temperature of a typical modern marine propulsion plant is ....	165 bar 515 °C	60 bar 515 °C	16 bar 400 °C	40 bar 400 °C
(III)	Rotor axial clearance can be measured while the rotor is stationary by ...	Poker gauge	Bridge gauge	Finger plate gauge	All of these gauges
(IV)	Condensate recirculation valve is shut when the plant is in the following state----	Manoeuvring	Warming through	Astern operation	Full ahead
(V)	The process within the	Constant enthalpy	Constant Entropy	Constant volume	Constant temperature

	labyrinth seal can be closely approximated to				
(VI)	With nozzle control the power developed by a steam turbine is controlled by ...	Varying the quantity of steam flowing	Varying the heat released keeping the steam flow constant	Varying the quantity of steam flowing and heat released	Varying the boiler pressure and condenser pressure
(VII)	A velocity compounded wheel is at times introduced at the HP inlet end so that ...	The HP turbine operates more efficiently	HP glands can be shortened	HP turbine can be operated at a lower speed	All of these
(VIII)	Which of the following statement is <b>NOT</b> true for a nozzle with inlet steam at 10 bar, superheated and exhaust pressure of 2.5 bar	The velocity at outlet from the nozzle will be supersonic	Mass flow through the nozzle cannot be increased by decreasing the exhaust pressure to 1.5 bar	Pressure at the throat will be approximately 4 bar	Velocity of steam at the throat will be equal to sonic velocity of steam at the temperature
(IX)	Which of the following statement is true for a double flow turbine	The steam makes two passes through the turbine and thus work output increases	The rotor tends to be longer and susceptible to sagging	The last few stages of the turbine are longer than a single flow turbine	The axial thrust increases and requires alternate means of balancing
(X)	The end part of each bearing shell is bored out to provide a strip about 0.254 mm below the level of the	Support the shaft should the white metal run and prevent the bearing shell from damage	Support the shaft should the white metal run and prevent moving blades	Support the shaft should the white metal run and prevent the lubricating oil in the bearing from draining out	Support the shaft should the white metal run and prevent gland fin damage

	white metal also known as 'Safety strip' and is intended to -		from touching the diaphragm		
--	---	--	-----------------------------	--	--

### Short answer type Questions (5 x 2 Marks)

- 2.(I) State reasons for fitment of shrouding in steam turbine blades.
- (II). State reasons why Steam turbines are often fitted with spring backed labyrinth glands
- (III). Explain why reaction turbine rotors are usually of the 'drum' type and not disc type.
- (IV). Explain the need for a 'Double helical gear' arrangement.
- (V). Explain the benefits of 'Sequential nozzle control'

### Part B

Long answer type Questions, Any five (5 x 10 Marks)

3. (a). Sketch and describe two methods of fixing blades to an impulse turbine rotor. (4 Marks)
- (b) Describe the function of steam turbine diaphragm. (3 Marks)
- (c) Explain with the help of a neat sketch the fixing arrangement of a diaphragm allowing for thermal expansion. (3 Marks)
4. (a) Explain with the help of a neat sketch the use and function of a 'Dummy Piston' (4 Marks)
- (b) A Steam turbine consists of a two row Curtis followed by 4 stages of Rateau if the mean blade diameter of the two row Curtis is 450 mm and the mean blade diameter of the 2<sup>nd</sup> and 3<sup>rd</sup> stage is 470 mm and for the 4<sup>th</sup> and 5<sup>th</sup> stages it is 490 mm. Draw the absolute pressure and velocity distribution curves for the turbine taking into consideration the given parameters of mean blade diameters. (6 Marks)
5. (a) List out at least 6 important differences between Impulse and Impulse reaction turbine. (4 Marks)
- (b) Draw a neat sketch /line drawing of a back pressure/condensing, multi stage pressure compounded impulse steam turbine. Indicate major components like bearings, steam seals, thrust block, rotor, casing, diaphragms, panting plate etc. (6 Marks)

6. (a) Explain how a marine propulsion plant of cross compounded arrangement can be operated if the HP turbine is damaged.

(4Marks)

(b) Write down the steps for warming through a turbine plant from cold.

(6 Marks)

7. (a) Draw the expansion arrangement for a steam turbine casing indicating freedom of movement. Indicate the movement of casing and movement of rotor in relation to each other. (4 Marks)

(b) With the help of suitable diagram/graph explain the advantages of Sequential control over Throttle control of a marine steam turbine.

(6 Marks)

8. (a) Write a short note on problems associated with steam turbine lubricating oil. (4 marks)

(b) Explain the function and construction of a turbine thrust block.

(3 Marks)

(c) Briefly state how oil clearance can be checked and adjusted.

(3 Marks)

9. (a) Write a short note bringing out the constructional details and advantages of a regenerative condenser. (4 Marks)

(b) Sketch and describe a gland sealing system for a main propulsion turbine. (6 Marks)