INDIAN MARITIME UNIVERSITY
Time Bound Assignment
B Tech (ME) Arrear Examinations
September/October 2020
UG11T2504/UG11T1504
Fluid Mechanics-II

Date: 14/09/2020 Max Marks: 70
Duration: 3 Hrs Pass Marks: 35

Part – A (compulsory)
Answer the following (10x2=20 Marks)

1. What is rotodynamic machine?
2. What is indicator diagram of a reciprocating machine?
3. Write down the various components of the reciprocating pump.
4. What is co-efficient of discharge and slip of a reciprocating pump?
5. Define Static head and Manometric head of a centrifugal pump.
6. What is priming of a pump? State it's necessity.
7. Draw the operating characteristics curve of a centrifugal pump.
8. When cavitation occurs in a pump?
9. Compare between Impulse and Reaction turbine.
10. Define specific speed of a turbine.

Part – B

Answer any 5 out of 7 questions (5 x 10= 50 marks)

11. (a) A 1/5 scale model of a centrifugal pump absorbs 20 kW when pumping against a test head of 8 m at its best speed of 400 r.p.m. If the actual pump works against 32 m head, find the speed and power required for the actual pump. Determine also the quantities of water discharged by the two pumps. **(7 Marks)**

    (b) Define the following non dimensional pump parameter: a. head co-efficient b. flow co-efficient c. power co-efficient. **(3 Marks)**

12. (a) Write down the working principle of a double acting reciprocating pump. **(5 Marks)**

    (b) A single-acting reciprocating pump operating at 120 r.p.m. has a piston diameter of 200 mm and stroke of 300 mm. The suction and

delivery heads are 4 m and 20 m, respectively. If the efficiency of both suction and delivery strokes is 75 percent, determine the power required by the pump. **(5 Marks)**

13. (a) Draw and discuss the ideal indicator diagram of a reciprocating pump. **(4 Marks)**

(b) A single-acting reciprocating pump has a diameter (piston) of 150 mm and stroke length 350 mm. The Centre of the pump is 3.5 m above the water surface in the sump and 22 m below the delivery water level. Both the suction and delivery pipes have the same diameter of 100 mm and are 5 m and 30 m long respectively. If the pump is working at 30 r.p.m., determine: the pressure heads on the piston at the beginning, middle and end of both suction and delivery strokes. **(6 Marks)**

14. (a) Classify the centrifugal pump on the basis of the characteristics feature. **(3 Marks)**

(b) Draw the velocity triangles at the inlet and outlet of a centrifugal compressor. Also, write down the significance of the various term in the velocity diagram at inlet and outlet. **(7 Marks)**

15. A centrifugal pump, in which water enters radially, delivers water to a height of 165 mm. The impeller has a diameter of 360 mm and width 180 mm at inlet and the corresponding dimensions at the outlet are 720 mm and 90 mm respectively; its rotational speed is 1200 r.p.m. The blades are curved backward at 30° to the tangent at exit and the discharge is 0.389 m^3/s. Determine:

(a) Theoretical head developed,
(b) Manometric efficiency
(c) The vane angle at inlet, and
(d) Power required to drive the pump assuming an overall efficiency of 70%.
(e) What would be corresponding mechanical efficiency?

(10 Marks)

16. (a) Define the following for a Pelton wheel: a. Gross Head, b. Net Head, c. Hydraulic efficiency, d. Mechanical Efficiency and e. Volumetric Efficiency. **(5 Marks)**

(b) A Pelton wheel having a mean bucket diameter of 1·2 m is running at 1000 r.p.m. The net head on the Pelton wheel is 840 m. If the side clearance angle is 15° and discharge through the nozzle is 0·12 m^3/s, determine:

(i) Power available at the nozzle, and

(ii) Hydraulic efficiency of the turbine **(5 Marks)**

(Assume no friction, Co-efficient of velocity=1)

17. A reaction turbine works at 450 r.p.m. under a head of 120 m. Its diameter at inlet is 1.2 m and the flow area is 0.4 m^2. The angles made by absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Determine:

(a) The volume flow rate,

(b) The power developed, and

(c) The hydraulic efficiency. **(10 Marks)**

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