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E – 4178

Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, August 2018
(2013 Scheme)
13.405 : FLUID MACHINERY (M)

Time : 3 Hours

Max. Marks : 100

Instruction : *Answer **all** questions in Part – **A** and **one full** question from **each** Module in Part – **B**.*

PART – A

Each question carries **2** marks.

1. Define impact of jets.
2. What are the functions of a draft tube ?
3. Define specific speed of a turbine.
4. List the effects of cavitation in centrifugal pumps.
5. Define NPSH in centrifugal pumps.
6. Explain specific speed of a centrifugal pump.
7. Define slip and negative slip in reciprocating pumps.
8. Define indicator diagram and its function.
9. What is chocking in compressors ?
10. Explain isentropic efficiency in rotary compressors.

P.T.O.

PART – B

Each question carries **20** marks.

Module – I

11. a) Find an expression for the efficiency of a series of moving curved vanes when a jet of water strikes the vanes at one of its tips. Also find the maximum efficiency and condition for maximum efficiency. **10**

    b) A pelton wheel is having a mean bucket diameter of 0.8 m and is running at 1000 rpm. The net head on the pelton wheel is 400 m. If the side clearance angle is 15° and discharge through nozzle is 150 liters/sec. Find (1) Power available at the nozzle and (2) Hydraulic efficiency of the turbine. **10**

OR

12. a) Describe the working of a governing mechanism of an impulse turbine with a neat sketch. **10**

    b) A propeller turbine runner has an outer diameter of 4.5 m and the diameter of the hub is 2 m. If is required to develop 20600 kw when running at 150 rpm, under a head of 21 m. Assuming hydraulic efficiency of 94% and overall efficiency of 88%, determine the runner vane angles at inlet and exit at the mean diameter of the vanes. Also determine the runner vane angles at inlet and exit at two sections near the hub and the outer periphery. **10**

Module – II

13. a) 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 150 mm diameter; the head loss in the suction pipe is 2.3 m and the delivery pipe is 7.4 m. The impeller is 420 mm diameter and 25 mm wide at the mouth; it revolves at 1200 rpm and its effective vane angle at exit is 35°. If manometric efficiency is 82% and overall efficiency is 72%, determine the discharge of the pump and power required to drive the pump. Also find the pressure head indicated at the suction and delivery branches of the pump. **10**

    b) Derive the expression for (1) Workdone by a centrifugal pump (2) Manometric efficiency of centrifugal pump. **10**

OR

14. a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm. Work against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/sec. The vanes are set back at an angle of 40° to the outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, determine (1) Vane angle at inlet (2) Workdone by impeller on water per second (3) Manometric efficiency. **10**

b) Write a detailed note on main and operating characteristics of centrifugal pumps. **10**

Module – III

15. a) A single acting reciprocating pump has a cylinder of diameter 150 mm and of stroke length 300 mm. The centre of the pump is 4 m above the water surface in the sump. The atmospheric pressure head is 10.3 m of water and pump is running at 40 rpm. If the length and diameter of the suction pipe are 5 m and 10 cm respectively, determine the pressure head due to acceleration in the cylinder (1) At the beginning of the suction stroke (2) In the middle of the suction stroke. **10**

b) Derive an expression for the head lost due to friction in the delivery pipe of a reciprocating pump with and without on air vessel. **10**

OR

16. a) Explain the working of (1) Hydraulic Ram with a neat sketch (2) Hydraulic reaccumulator with a sketch. **10**

b) Explain in detail the working of the following with a neat sketch (1) Jet pump (2) Vane pump. **10**

Module – IV

17. a) An air compressor draws in air at 1 bar and 20° C and compresses at recording to law $PV^{1.2} = C$. The delivery pressure is 10 bar. Calculate (a) The temperature at the end of compression (b) Transfer of heat during compression process (c) pdv work during compression process (d) The work done during delivery. **10**

b) Explain the working of a vane compressor with a neat sketch. **10**

OR

18. a) Discuss in detail on classification of air compressors with a neat sketch. **10**

b) Write detailed notes on :

1) Slip factor and pressure coefficient of a centrifugal compressor.

2) Workdone by a single stage compressor with and without clearance volume. **10**
