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Reg. No. : .....

Name : .....

**Fourth Semester B.Tech. Degree Examination, February 2016**  
**13.405 : FLUID MACHINERY (M)**

Time : 3 Hours

Max. Marks : 100

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

**PART – A**

1. Define the terms speed ratio and jet ratio applied to a pelton turbine.
2. Define and explain the significance of specific speed of a turbine.
3. Explain the characteristic curves of a turbine.
4. Differentiate between volute casing and vortex casing for a centrifugal pump.
5. What is priming ? Why it is necessary ?
6. Define and explain NPSH.
7. What you meant by negative slip of a reciprocating pump ?
8. Explain the term "capacity" of a hydraulic accumulator.
9. Explain multistaging applied to air compressors.
10. Explain the term degree of reaction applied to an axial flow compressor. **(10×2=20 Marks)**

**PART – B**

**(Each full question carries 20 marks)**

**Module – I**

11. a) Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%.
- b) Design a pelton wheel for a head of 80m and speed 300 rpm. The pelton wheel develops 103 kW S.P. Take  $C_v = 0.98$ , Speed ratio = 0.45 and overall efficiency = 0.80.

OR

P.T.O.



12. a) What are unit quantities ? Define unit quantities of a turbine. Why are they important ?
- b) A turbine develops 7358 kW S.P. When running at 200 rpm. The head on the turbine is 40m. If the head on the turbine is reduced to 25 m determine the speed and power developed by the turbine.

### Module – II

13. a) Derive an expression for the minimum starting speed of a centrifugal pump.
- b) A single stage centrifugal pump with impellor diameter of 30 cm rotates at 2000 rpm and lifts  $3\text{m}^3$  of water per second to a height of 30m with an efficiency of 75%. Find the number of stages and diameter of each impellor of a similar multistage pump to lift  $5\text{m}^3$  of water per second to a height of 200 meters when rotating at 1500 rpm.

OR

14. a) Explain the characteristic curves of a centrifugal pump.
- b) A centrifugal pump is to discharge  $0.12\text{m}^3$  at a speed of 1400 rpm against a head of 30m. The diameter and width of impellor at outlet are 25 cm and 5 cm respectively. If the manometric efficiency is 75% find the vane angle at outlet.

### Module – III

15. a) What is an indicator diagram ? Prove that the area of indicator diagram is proportional to the work done by the reciprocating pump.
- b) A single acting reciprocating pump has piston diameter 15 cm and stroke length 30 cm. The centre of the pump is 5m above the water level in the sump. The diameter and length of the suction pipe are 10 cm and 8 m respectively. The separation occurs if the absolute pressure head in the cylinder during suction stroke falls below 2.5 m of water. Calculate the maximum speed at which the pump can run without separation. Take Atmospheric pressure = 10.3 m of water.

OR

16. a) Find an expression for the head loss due to friction in suction and delivery pipes of a reciprocating pump.
- b) With the help of a neat sketch explain the working of a hydraulic ram.





**Module – IV**

17. a) With the help of a diagram explain the working of a vane compressor.
- b) A single cylinder single acting reciprocating air compressor has bore and stroke of 15 cm and 25 cm respectively. The suction conditions are 1 bar and 25°C. The speed of compressor is 800 rpm and the delivery pressure is 8 bar. The clearance ratio is 0.04 and the index of expansion and compression is 1.3, find
- a) Indicated power and
  - b) Volumetric efficiency.

OR

18. a) Explain the working of a centrifugal compressor.
- b) Sketch a screw compressor and explain its working.
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