



(Pages : 3)

8700

Reg. No. :

Name :

**Third Semester B.Tech. Degree Examination, December 2015
(2008 Scheme)**

08.303 : FLUID MECHANICS AND MACHINES (MPU)

Time : 3 Hours

Max. Marks : 100

Instructions : Answer *all* questions in *Part A* and *each* carries 4 marks, and *one full* question from *each* Module in *Part B*, *each* Module carries 20 marks.

PART – A

1. State Newton's law of viscosity and briefly explain its importance in the analysis of fluid flow.
2. The weight of 10 litre. of a liquid is 70 N. Find its mass density, specific weight, specific volume and specific gravity.
3. What is piezometer tube ? State why piezometer tube cannot be used for measurement of large pressures.
4. State the difference between hydrodynamic head, pressure head and piezometric head.
5. Obtain expression for the force exerted by a jet of water striking normally on fixed and moving inclined flat plate.
6. What is the reason for using pelton turbine when the head available is high ?
7. A jet of water 25 mm diameter strikes a flat plate at an angle 30° with the axis of the jet. If a force of 1000 N is exerted on the plate by the jet in the direction of flow, find the rate of flow of water.
8. Explain with neat sketch the working of centrifugal pump.
9. What is the importance of dimensional analysis ?
10. Explain, what is the function of air vessel in reciprocating pump ?



P.T.O.



PART – B

Module – I

11. a) With neat sketch explain the principle of venturimeter. Derive an expression for flow rate of a fluid through it.
- b) A horizontal pipe carrying water at a rate of $0.45 \text{ m}^3/\text{sec}$. suddenly enlarges from a diameter 24 cm to 48 cm. The pressure intensity in the smaller pipe is 150 kN/m^2 . Find the loss of head and power loss due to the enlargement in flow area. Also find the pressure in the larger pipe after sudden expansion.
12. a) Explain the following :
- Reynolds number
 - Siphon effect
 - Water hammer.
- b) A block of weight density 1406.3 N/m^3 moves down a plane inclined 30° with the horizontal. The block dimensions are $0.4 \text{ m} \times 0.4 \text{ m} \times 0.2 \text{ m}$. The plate moves such that $0.4 \text{ m} \times 0.4 \text{ m}$ side is parallel to the plane. There is a uniform layer of oil 0.05 mm , thick between the block and plane. If the viscosity of the oil used is 0.056 poise. Find the steady state velocity of the block.

Module – II

13. a) Show that the maximum efficiency of a jet strikes at the centre of a moving curved vane is $\frac{8}{27}(1 + \cos \alpha)$.
- b) A jet of water having velocity of 50 m/sec . strikes a series of flat plates arranged around the periphery of a wheel. If the plates are moving at a velocity of 12 m/sec . Find the workdone per kg of water per second and the efficiency of the system. What would be the speed of the plates so that the efficiency is maximum ? Also find the maximum efficiency.
14. a) Write notes on the following :
- Surge tank
 - Draft tube
 - Unit speed, unit discharge unit power.
- b) The runner of a inward flow reaction turbine running at 200 rpm has internal and external diameter 0.5 m and 1 m respectively. The jet makes an angle of 10° , the discharge at outlet is radial. The velocity of flow at inlet and outlet are the same and is 2 m/sec . The width of the runner at inlet is 0.25 m . Find the runner blade angles and width of the runner at out let. Also estimate the power developed by the runner.



Module – III

15. a) Derive the expression for pressure head due to acceleration of the piston of a reciprocating pump. Assume motion of the piston to be simple harmonic.
- b) A single acting reciprocating pump located 3.8 m above the sump level delivers water to a height of 12 m. The suction pipe diameter is 30 mm and is 4 m long. The delivery pipe is also 30 mm diameter, but the length is 20 m. The cylinder diameter and stroke length are 90 mm and 120 mm respectively. Its separation occurs 76.518 KPa below atmospheric pressure. Find the maximum speed at which pump should be operated without separation. Take barometer reading as 760 mm of mercury.
16. a) What is the difference between single stage and multistage centrifugal pump ? Briefly explain multistage pump
- i) impeller in parallel
 - ii) impeller in series.
- b) A centrifugal pump driven by 500 kw motor, runs at 550 rpm and delivers 58.8 m³/min. of water under an effective head of 35 m. The diameter and width of impeller at outlet are 0.8 m and 0.1 m respectively. The impeller vane angle at outlet is 40° and water enters the impeller vanes radially. Find out the manometric, mechanical and overall efficiency of the pump.

