

**R09**

**Code No: 09A30202**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD**

**B.Tech II Year I Semester Examinations, May/June-2013**

**Fluid Mechanics and Hydraulic Machinery  
(Electrical and Electronics Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions**

**All questions carry equal marks**

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- 1.a) What is a manometer. How are they classified? Explain with sketches.
- b) The pressure intensity at a point in a fluid is given as  $4.9 \text{ N/cm}^2$ . Find the corresponding height of fluid when it is: (i) water, and (ii) an oil of sp.gr.0.8. [15]
- 2.a) Define the equation of continuity. Obtain an expression for continuity equation for a one dimensional flow.
- b) Water is flowing through a pipe having diameters 30 cm and 15 cm at the bottom and upper end respectively. The intensity of pressure at the bottom end is  $29.43 \text{ N/cm}^2$  and the pressure at the upper end is  $14.715 \text{ N/cm}^2$ . Determine the difference in datum head if the rate of flow through pipe is 50 lit/s. [15]
- 3.a) What do you mean by “equivalent pipe” and “flow through parallel pipes”?
- b) Two pipes of lengths 2500 m each and diameters 80 cm and 60 cm respectively, are connected in parallel. The co-efficient of friction for each pipe is 0.006. The total flow is equal to 250 liters/s. Find the rate of flow in each pipe. [15]
4. A jet of water 15 mm diameter impinges on a series of curved vanes exactly at their center and is deflected by  $170^\circ$ . The velocity of the jet is 12 m/sec and the velocity of the vane is 6 m/sec. If the vanes are arranged on the periphery of a wheel such that there is at least one curved vane always taking the jet at all times, estimate the power developed and the efficiency of the wheel. [15]
- 5.a) Describe different structures associated with the intake to penstock. Discuss their uses.
- b) What are underground power houses? Discuss the advantages and disadvantages of an underground power house. [15]
- 6.a) Describe the theory of a draft tube with the help of a neat sketch.
- b) Design a single jet Pelton wheel to develop a power of 600 KW under a head of 180 m while running at 320 rpm. Assume  $K_u = 0.45$ ,  $C_v = 0.985$  and overall efficiency = 85%. Calculate the jet diameter, wheel diameter and number of buckets. Give a fully dimensional sketch of a bucket. [15]
- 7.a) What is specific speed. State its significance in the study of hydraulic machines.
- b) By means of a neat sketch, explain the governing mechanism of Francis Turbine. [15]
- 8.a) Define the terms:  
(i) Priming (ii) Manometric efficiency (iii) Net positive suction head.
- b) A centrifugal pump running at 1220 rpm delivers  $0.25 \text{ m}^3/\text{s}$  against a head of 20 m. Calculate the discharge, head and power if the speed is increased to 1440 rpm. [15]

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