

7. (a) How is Kaplan turbine is different from a Francis turbine? Under what conditions Kaplan turbine is suited?
- (b) The nozzle of a Pelton wheel is 38 mm in diameter, the head at the nozzle is 152 m, $C_v = 0.97$, wheel diameter = 380 mm, relative velocity at discharge = 0.85 times relative velocity at inlet, discharge edge of blading is at 15° to the plane of motion of blading. Calculate the unit power and unit speed if the blade speed is 0.46 of the jet speed.
8. (a) Derive the expression for minimum speed required to start a centrifugal pump.
- (b) A centrifugal pump has a 300 mm diameter impeller and an outlet width of 50 mm. It runs at 1000 rpm delivering water against a head of 15 m. The vane are curved backwards at angle of 30° with the periphery at outlet. The manometric efficiency of the pump is 90%. Calculate the discharge.

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[06 BENG-2104]

II/IV B.Tech. DEGREE EXAMINATION

First Semester

Electrical and Electronics Engineering

FLUID MECHANICS AND HYDRAULIC
MACHINERY

(Effective from the admitted batch of 2015-2016)

Time : Three hours

Maximum : 70 marks

Question No.1 is compulsory.

Answer any FOUR questions from 2 to 8.

All questions carry equal marks.

1. (a) Explain Newton's law of viscosity and distinguish between Newtonian and Non-Newtonian fluids.
- (b) What is absolute pressure, gage pressure and vacuum pressure? What is the relation between them?
- (c) Distinguish between streamlines, streak lines and path lines.
- (d) Enumerate various forms of energies which the Bernoulli's equation taken into account.

- (e) What are minor losses in pipe flow? Under what circumstances will they be negligible?
- (f) State the principle on which turbomachines are based?
- (g) What precautions are to be taken while starting and closing the centrifugal pump?
2. (a) A capillary tube of 2mm diameter is dipped in
- (i) Water
- (ii) Mercury find the capillary rise for each case. Surface tension of water and mercury may be taken as 0.075 N/m and 0.52 N/m respectively. The contact angle may be taken as 0° and 130° for water and mercury respectively.
- (b) Obtain an expression for the depth of centre of pressure when the lamina is immersed in a liquid and is at angle with the horizontal.
3. (a) State the principle of conservation of mass. Derive the 3 - dimensional continuity equation in Cartesian coordinate system.
- (b) Find the velocity components if the velocity potential function is given by $\phi = a \cos xy$.

4. (a) Derive the expression for discharge passing through a venturi meter.
- (b) A pipe line carrying oil of specific gravity 0.87 changes in diameter from 200 mm diameter at a position A to 500 mm diameter at a position B which is 4 m at a higher level. If the pressures at A and B are 98.1 kpa and 58.86 kpa respectively and the discharge is 200 lit/sec, determine the loss of head and the direction of flow.
5. (a) Derive the expression of head loss due to sudden expansion in a pipe line.
- (b) Find the maximum power available at the far end of a hydraulic pipe line 4.8 km long 200 mm diameter when 6870 kpa pressure is fed at the near end. Take $f = 0.007$.
6. (a) A jet 120 mm diameter moving at 20 m/s strikes a plate which remains at rest. Find the force exerted on the plate normal to it when
- (i) The plate is held normal to the jet and
- (ii) When the plate makes an angle of 60° to the jet.
- (b) What is a draft tube? What are various types and functions of draft tube?

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Oct-16