[Total No. of Questions - 9] [Total No. of P ted Pages - 2]
(2066)

16040(J) J-16

B. Tech 4th Semester Examination

Hydropower and Fluid Machines (NS)

CE-223

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. What are the different methods of classifying the hydro-electric power plants? Explain firm power and secondary power, plant capacity and installed capacity for a hydro-electric power plant. (20)

2. Explain the working and maintenance of a hydro power plant. Support your answer with neat sketches. What are various constraints in hydropower development? (20)

SECTION - B

3. Explain reservoir sedimentation, How does it affect life of a reservoir? Explain the principle of de-silting and design of a de-silting basin. (20)

4. What do you understand by water hammer in pipe line? Derive the expression for the water hammer pressure in case of (i) rigid pipe and (ii) elastic pipe. (20)

SECTION - C

5. (a) What factors affect occurrence of cavitation in turbines? What are the measures to prevent it? (10)

(b) A jet of water issues, from a nozzle with a velocity 20 m/s and it impinges normally on a flat plate moving away from it at 10 m/s. The cross sectional area of the jet is 0.01 m^2 and the density of water is 100 kg/m^3. Determine the force developed on the plate. (10)

6. A Pelton wheel has a mean bucket speed of 12 m/s and is supplied with water at the rate of 750 lit/sec under a head of 35 m. If the buckets deflect the jet through an angle of 160°, find the power and efficiency of the turbine. Take the coefficient of velocity as 0.98. (20)

SECTION - D

7. (i) A double acting reciprocating pump having piston area 0.1 m^2 has a stroke 0.30 m long. The pump is discharging 2.4 m^3 of water per minute at 45 r.p.m through a height of 10 m. Find the slip of the pump and the power required to drive the pump. (10)

   (ii) Explain 'slip' and 'cavitation' with respect to reciprocating pumps. (10)

8. (i) Find the power required to drive a centrifugal pump which delivers 50 litres of water per second to a height of 25 m through a 150 mm diameter and 100 m long pipeline. The overall efficiency of pump is 70% and Darcy's f = 0.06 for the pipeline. Assume inlet losses in suction pipe equal to 0.33 m. (15)

   (ii) Sketch the working of a single stage centrifugal pump. (5)

SECTION - E

9. Write short notes on the following:
   (i) Under what condition would a reaction turbine act as a pump?
   (ii) Power house and its various components
   (iii) Intakes for a hydropower project
   (iv) Classification of centrifugal pumps
   (v) Jet propulsion
   (vi) Working of reciprocating pump
   (vii) Kaplan turbine
   (viii) Pelton runners. (8×2½=20