H.T.No. | | | | | | | | | | |

Code No: ME1521 **GEC-R14**

III B. Tech I Semester Regular Examinations, November 2016

HYDRAULIC MACHINES AND SYSTEMS

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B.** All Questions carry equal Marks.

PART-A

6 × 2 = 12M

1. List out the different types of dams.
2. Find the force exerted by the a jet of water of diameter 75 mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 20 m/s.
3. Differentiate between the Francis and Kaplan turbine.
4. Define slip, percentage slip and negative slip of a reciprocating pump.
5. What is priming? Why is it necessary?
6. What is a hydraulic accumulator?

PART-B

4 × 12 = 48M

1. a) What are the different types of Hydro Electric Power Plants? (6M)

   b) A run of river plant is installed on a river having a minimum flow of $15m^3/s$. If the plant is used as a peak load plant operating only for 6 hours a day, determine the firm capacity of the plant i) without pondage, ii) with pondage but allowing 10% of the water to be lost in evaporation and other losses. Head at the plant is 10 m and the plant efficiency may be assumed as 85%. (6M)

2. A jet of water having a velocity of 20 m/s strikes a curved vane, which is moving with a velocity of 10 m/s. The jet makes an angle of 20° with the direction of motion of vane at inlet and leaves at an angle of 130° to the direction of motion of vane an outlet. Calculate:(i) vane angles, so that the water enters and leaves the vane without shock, (ii) work done per second per weight of water striking (or work done per unit weight of water striking) the vane per second. (12M)

3. a) A Kaplan turbine working under a head of 20 m develops 11772 kW shaft power. The outer diameter of the runner is 3.5 m and hub diameter 1.75 m. The guide blade angle at the extreme edge of the runner is 35°. The hydraulic and overall efficiency of the turbines are 88% and 84% respectively. If the velocity of whirl is zero at outlet, determine: (i) runner vane angles at inlet and outlet at the extreme edge of the runner, and (ii) speed of the turbine. (6M)

   b) Draw and discuss the characteristics curves of the turbine. (6M)

4. a) A single acting reciprocating pump, running at 50 r.p.m., delivers 0.01 m^3/s of water. The diameter of the piston is 200 mm and stroke length 400 mm. determine:

   i) the theoretical discharge of the pump,
   ii) Co–efficient of discharge, and (iii) slip and (iv) the percentage slip of the pump. (6M)

   b) Explain the working principle of Gear Pump with neat sketch. (6M)

5. a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 r.p.m works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outlet diameter of the impeller is 500 mm and width at outlet is 50 mm, determine:

   i) vane angle at inlet,
   ii) work done by impeller on water per second, and
   iii) Manometric efficiency. (8M)

   b) Define Cavitation. What are the effects of Cavitaion? (4M)

6. a) An accumulator is loaded with 40 kN weight. The ram has a diameter of 30 cm and stroke of 6 m. its friction may take as 5%. It takes two min. to fall through its full stroke. Find the total work supplied and power delivered to the hydraulic by the accumulator, when 7.5 lit/s is being delivered by a pump, while the accumulator descends with the stated velocity. (6M)

   b) Explain any two types of control valves working principle with the help of neat sketches. (6M)

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