

R09**Code: 9A01402**

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2015/2016

HYDRAULICS & HYDRAULIC MACHINERY

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 (a) Discuss the factors affecting Chezy's c and Manning's n . What are the different values of ' n ' for different surfaces?
(b) Determine the dimensions of an economical Trapezoidal section of an open channel with sides slope 2H:1V laid at a slope of 1 in 1600 to carry a discharge of 36 cumecs assuming Chezy's coefficient $C = 50$.
- 2 (a) Derive the dynamic equation for gradually varied flow. Explain the assumptions made.
(b) A rectangular channel 6 meters wide has a uniform slope of 1 in 2000. Normal flow occurs when there is a constant depth of 0.90 meter and the quantity flowing is 8.50 cumec. A dam placed across the channel raises the depth just upstream of the dam to 1.89 meter when 8.50 cumec is flowing. Find how far the depth will be 1.50 meter.
- 3 (a) Explain the terms: (i) Geometrical. (ii) Kinematics. (iii) Dynamic similarities.
(b) Give the uses of Buckingham's Pi theorem.
- 4 (a) Show that when a jet of water impinges on a series of curved vanes, maximum efficiency is obtained when the vane is semi-circular in section and the velocity of vane is half that of jet.
(b) A jet of water 100 mm diameter and having a velocity of 15 m/s impinges at the center of a hemispherical vane. The linear velocity of vane is 5 m/s in the direction of the jet. Find the force exerted on the vane. How this force would change if the jet impinges on a series of vanes attached to the circumference of a wheel?
- 5 (a) Explain the design specifications of a Kaplan turbine.
(b) A Pelton wheel has to be designed to develop 12,000 KW of power at an overall efficiency of 86%. The speed is 520 rpm and the head is 400 m. The wheel velocity is 0.46 times the jet velocity. Assuming a nozzle coefficient of 0.975 and an approximate jet ratio of 10, calculate the wheel diameter, number of jets, diameter of each jet and the number of buckets.
- 6 (a) What is specific speed? State its significance in the study of hydraulic machines.
(b) What are constant efficiency curves of a turbine? What are their uses?
- 7 (a) Explain the role of cavitation in centrifugal pumps.
(b) Two geometrically similar pumps are running at the same speed of 1440 rpm. One pump has an impeller diameter of 40 cm and lifts 1000 liters per minute of water against a head of 20 m. Determine the head and the impeller diameter of the second pump to deliver 50% discharge.
- 8 (a) Describe various types of Hydal schemes
(b) What are underground power houses? Discuss the advantages and disadvantages of a underground power house.
