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Total number of printed pages – 2

B. Tech
BEME 2209

Third Semester Examination – 2013
FLUID MECHANICS AND MACHINES
BRANCH : ENV, PLASTIC, BIOTECH, MARINE
QUESTION CODE : C- 490

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
- (a) State Archimedes principle and its application.
 - (b) With the help of an experiment explain streak line.
 - (c) Define hydraulic gradient line.
 - (d) If specific gravity of a liquid is 0.8, calculate for its mass density, specific weight.
 - (e) Define C_v , C_d and C_c of orifice meter.
 - (f) What do you mean by priming of a centrifugal pump?
 - (g) State the function of air vessels in reciprocating pump.
 - (h) Why reaction turbines exhaust its tail water through a draft tube ?
 - (i) Why governing of hydraulic turbines is necessary ?
 - (j) Briefly explain the functions of hydraulic ram.
2. (a) Distinguish between metacentre and metacentric height with the help of a neat sketch. 5
- (b) At a point in a layer of fluid, the shear stress is 0.156 N/m^2 and the velocity gradient is 0.2 m/s/m . Calculate dynamic viscosity. 5
3. (a) The velocity components in a two-dimensional flow are
- $$U = y^3/3 + 2x - x^2y$$
- $$V = xy^2 - 2y - x^3/3$$
- Show that these components represent a possible case of an irrotational flow. 5

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- (b) An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Assume $C_d = 0.98$. 5
4. A 300 mm × 150 mm venturimeter is to be replaced by an orificemeter. Both the meter are to give same mercury differential in manometer for a discharge of 100 lit/sec. The inlet diameter to remain 300 mm. What should be the diameter of orifice ? The coefficient of discharge of venturimeter and orifice meter are 0.98 and 0.6. 10
5. (a) Define and derive specific speed of hydraulic turbine. 5
 (b) A single acting reciprocating pump has its piston diameter 15 cm and stroke length of 30 cm. It discharges 300 litre of water per minute at 60 rpm. The suction and delivery heads are 10 m and 25 m respectively. Determine the theoretical discharge, coefficient of discharge and percentage of slip of the pump. How much power will be required to drive the pump with its efficiency is 70%. 5
6. (a) A centrifugal pump is required to deliver 40 litres of water per second to a height of 25 m through a 150 mm diameter and 100 m long pipe. The overall efficiency of pump is 78% and Darcy's friction factor for the pipe is 0.04. Determine the motor power to drive the pump. Assume no other losses in the pipe liner. 5
 (b) Explain what do you mean by Net Positive Suction Head in case of a centrifugal pump. 5
7. (a) With the help of a neat sketch, explain governing of reaction turbine. 5
 (b) Explain working of a hydraulic intensifier with a neat sketch. 5
8. Distinguish between the following : 2.5 × 4
 (a) Kinematic viscosity and dynamic viscosity
 (b) Impulse turbines and reaction turbines
 (c) Notch and weir
 (d) Rotodynamic pump and positive displacement pump.

