KUMARAGURU
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Register Number:……..

B.E DEGREE EXAMINATIONS: DEC 2014

(Regulation 2009)

Third Semester

MEC106: FLUID MECHANICS AND MACHINERY

(Common to AERO/AUTO/ME)

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The dynamic viscosity is 1.2×10^{-4} Ns/m^2. The density is 600 kg/m^3. The kinematic viscosity in m^2/s is

   a) 20×10^{-8} b) 72×10^{-3}

   c) 7.2×10^{3} d) 70×10^{6}

2. As tube diameter decreases the capillary rise _____.

   a) Increases b) Decreases

   c) Remains same d) No flow of fluid

3. If the following condition appear,2000 < Re < 4000 the flow is known as

   a) Transitional flow b) Laminar flow

   c) Turbulent flow d) pseudo laminar flow

4. When the changes in volume and density of fluid are insignificant, the flow is said to be _____flow.

   a) compressible b) incompressible

   c) ideal d) laminar

5. _____is defined as the force exerted by a flowing fluid on a solid body in the direction of flow

   a) drag force b) hydraulic force

   c) gravity force d) Lift force

6. The line representing the sum of pressure head, datum head and velocity head with respect to some reference line is known as _____

   a) unsteady energy line b) total energy line

   c) partial energy line d) steady energy line

7. Example of a pure reaction turbine is

a) Francis turbine b) Propeller turbine

c) Kaplan turbine d) Lawn sprinkler.

8. Dimensionless specific speed for kaplan turbine is about

a) 0.9 b) 9

c) 90 d) 900

9. Slip in the case of a centrifugal pump

a) Reduces the flow rate. b) Reduces the energy transfer.

c) Reduces the speed. d) Increases cavitation.

10. Acceleration head is affected by _____ and _____.

a) length of pipe, speed b) velocity,flow

c) viscosity,friction d) gravity,acceleration

PART B (10 x 2 = 20 Marks)

11. What are manometers?
12. What is meant by capillary rise and capillary depression?
13. What is meant by Flow net?
14. Write few applications of Bernoulli's equation
15. What is meant by hydraulic gradient line?
16. Explain the term 'Pipes in parallel'.
17. Give the types of draft tubes used
18. What are the components of a governing system?
19. What is the function of a hydraulic pump?
20. What is cavitation in hydraulic pump? What are its effects?

PART C (5 x 14 = 70 Marks)

21. a) (i) What are Newtonian and Non Newtonian Fluids? Explain. (10)

(ii) Determine the capillary depression of mercury in a 4 mm ID glass tube. Assume surface tension as 0.45 N/m and β=115°. (4)

(OR)

b) (i) In a test set up as in figure to measure viscosity, the cylinder supported by a torsion spring is 20 cm in dia and 20 cm long. A sleeve surrounding the cylinder rotates at 900 rpm and the torque measured is 0.2 Nm. If the film thickness between the cylinder and sleeve is 0.15 mm, determine the viscosity of the oil. (7)

(ii) Explain the concept of surface tension of fluids. (7)

22. a) (i) Using Bernouli's equation determine the flow rate of water across the shutter in an open canal when the water level upstream of shutter is 5m and downstream is 2m. The width of the canal is 1m and flow is steady (7)

(ii) The volume flow rate of a gas through a sharp edged orifice is found to be influenced by the pressure drop, orifice diameter and density and kinematic viscosity of the gas.Using the method of dimensional analysis obtain an expression for the flow rate. (7)

(OR)

b) (i) Derive Euler's equation of motion for flow along a stream Line. (10)

(ii) Describe the principle of dimensional homogeneity. (4)

23. a) (i) Determine the stream function for a uniform x directional flow towards the origin from the positive x direction at 5m/s and a source of strength 12 m (7)

(ii) A liquid of specific gravity 1.3 flows in a pipe at a rate of 800 l/s, from point 1 to point 2 which is 1 m above point 1. The diameters at section 1 and 2 are 0.6 m and 0.3 m respectively. If the pressure at section 1 is 10 bar, determine the pressure at section 2. (7)

(OR)

b) (i) What are energy line and hydraulic gradient line? Explain (7)

(ii) Water from reservoir at a height of 8m from datum flows through Two pipes of 0.35 m and 0.25 m dia and length 2000 m and 1500 m with f values 0.021 and 0.018 connected is series Calculate quantity of water flowing. Neglect minor losses. (7)

24. a) (i) Explain how hydraulic turbines are classified. (7)

(ii) Determine the specific speed for the data available at a location as given below (Both dimensionless and dimensional). Head available: 900 m. Power estimated 40000 kW, Speed required: 417.5 rpm. Also indicate the suitable type of turbine. (7)

(OR)

b) (i) Describe the Significance of specific speed. (7)

(ii) A Pelton turbine is to produce 15 MW under a head of 480 m when running at (7)

500 rpm. If D/d = 10, determine the number of jets required.Assume η_0 = 85%, C_v = 0.97, ϕ = 0.46

25. a) (i) Draw the characteristic curves for pump and Explain. (7)

(ii) A centrifugal pump when tested with Brine of density 1190 kg/m^{3}discharged 60 l/s against a pressure of 300 kPa. It is desired to investigate the change in power when a similar pump is used to pump petrol of density 700 kg/m^3 against the same pressure. It is desired to keep the speed the same. Check whether any change in the drive motor is required. Assume an overall efficiency of 70% in both cases. (7)

(OR)

b) (i) What are the losses in Centrifugal Pumps? Explain. (7)

(ii) Show that in a double acting pump the work saved by fitting air vesselsis about 39.2%. (7)

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