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B.E. DEGREE EXAMINATIONS: NOVEMBER 2009

Third Semester

U07ME303: FLUID MECHANICS AND MACHINERY

(Common to Aeronautical Engineering & Mechanical Engineering Branches)

Time: Three hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. A Newtonian fluid is defined as the fluid which

(a) in compressible and non viscous (b) obeys Newton's law of viscosity

(c) is highly viscous (d) is compressible and non viscous

2. Pascal's law states that pressure at a point is

(a) in a liquid at rest (b) in a fluid at rest

(c) in a laminar flow (d) in a turbulent flow

3. The range of co-efficient discharge for a venturimeter is

(a) 0.6 to 0.7 (b) 0.7 to 0.8 (c) 0.8 to 0.9 (d) 0.95 to 0.99

4. Continuity equation is deals with law of conservation of

(a) mass (b) momentum (c) energy (d) none of the above

5. Reynold number is

(a) $\rho VD/\mu$ (b) $\rho VD/L$ (c) $\rho VD/v$ (d)$\rho VD/m$

6. The pipe friction is determined by

(a) darcy-wiscback formula (b) chassis formula

(c) Reynolds number (d) fraud number

7. Reaction turbine is

(a) Possess kinetic energy (b) possess potential and kinetic energy

(c) Kinetic energy and pressure energy (d) pressure energy only

8. Kaplan turbine is a propeller turbine in which the vanes fixed on the hub are

(a) Non-adjustable (b) adjustable (c) fixed (d) none of the above

9. The work saved by fitting an air vessel to a double acting reciprocating pump is

(a) 39.2% (b) 84.8% (c) 48.8% (d) 92.3%

10. The discharge through a single acting reciprocating pump is

(a) Q = ALN/60 (b) Q = 2ALN/60 (c) = ALN (d) = 2ALN

PART B (10 x 2 = 20 Marks)

11. Determine the viscosity of a liquid having kinematic viscosity 6 stokes and specific gravity 1.9.
12. Define Pascal's law.
13. The diameters of a pipe at the sections 1 and 2 are 10 cm and 20 cm respectively. Find t discharge through the pipe if the velocity of water flowing through the pipe at section 1 is m/s. Determine the velocity at section 2.
14. Differentiate between Local acceleration and Convective acceleration.
15. Write the equation for pipe friction.
16. Define Buckingham's π theorem.
17. Define impulse turbine and reaction turbine.
18. An inward flow reaction turbine has external and internal diameters as 1m and 0.5 respectively. The velocity of flow through the runner is constant and is equal to 1.5 m/ Determine discharge through the runner and width of the turbine at outlet if the width o the turbine at inlet is 200 mm.
19. What is meant by cavitations in pumps?
20. Define specific speed of a centrifugal pump.

PART C (5 x 14 = 70 Marks)

21 (a) Two large plane surfaces are 2.4 cm apart. The space between the surfaces is filled with glycerin. What force is required to drag a very thin plate of surface area 0.5 square meter between the two large plane surfaces at a speed of 0.6 m/s. if the thin plate is in the middle of the two plane surfaces and the thin plate is at a distance of 0.8 cm from one of the plane surfaces? Take the dynamic viscosity of glycerin is 8.10×10^{-1} N s/m^2.

(OR)

(b) (i) Explain briefly the working principle of Bourdon tube pressure Gauge with neat sketch. (10)

(ii) What is manometer? How are they classified? (4)

22 (a) Derive the Bernoulli's equation from Euler equation of motion. State its assumptions.

(OR)

(b) The velocity potential function (ϕ) is given by an expression $\phi = -\frac{xy^3}{3} - x^2 + \frac{x^3 y}{3} + y^2$

(i) Find the velocity components in x and y direction. (7)

(ii) Show that ϕ represents a possible case of flow. (7)

23 (a) (i) Obtain a relationship between shear stress and pressure gradient. (9)

(ii) Explain a boundary layer separation and its control. (5)

(OR)

(b) (i) A 2500m long pipeline is used for transmission of power.120KW power is to be transmission the pipe in which water having a pressure of 4000KN/m^2 at inlet is flowing. If the pressure drop over the length of pipe is 800 KN/m^2 and f = 0.006.find (1) Diameter of pipe and (2) Efficiency of transmission. (12)

(ii) What is meant by equivalent pipe? (2)

24 (a) A pelton wheel works under a gross head of 510m. One third of gross head is lost in friction in the penstock. The rate of flow through the nozzle is 2.2m^3/sec.The angle of deflection of jet is 165°.Find the (i) power given by water to the runner (ii) hydraulic efficiency of pelton wheel. Take (v = 1 and speed ratio = 0.45).

(OR)

(b) (i) Give the comparison between impulse and reaction turbine. (4)

(ii) A pipe line of 0.6 m diameter is 1.5 km long. To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. Neglecting minor losses, find the increase in discharge if 4f = 0.04. The head at inlet is 300 mm (10)

25 (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 outer 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.

(OR)

(b) (i) with a neat sketch, Explain briefly the working principle of vane type displacement pump. (7)

(ii) What is reciprocating pump? Describe the principle and working of a reciprocating pump with a neat sketch. (7)

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