Reg. No. : | | | | | | | | | | |

Question Paper Code: 50734

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Third Semester

Mechanical Engineering

15UME304 - FLUID MECHANICS AND MACHINERY

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Dynamic viscosity of most of the gases with rise in temperature

   (a) increases (b) decreases
   (c) remains unaffected (d) unpredictable

2. The equation of continuity of flow is based on the principle of conservation of

   (a) flow (b) mass
   (c) momentum (d) energy

3. For pipes, turbulent flow occurs when Reynolds number is

   (a) less than 2000 (b) between 2000 and 4000
   (c) more than 4000 (d) none of these

4. Bernoulli equation deals with the law of conservation of

   (a) mass (b) momentum
   (c) energy (d) work

5. Froude number is the ratio of inertia force to

   (a) gravitational force (b) surface tension
   (c) elasticity (d) viscosity

6. What are the dimensions of kinematic viscosity of a fluid?

(a) LT^{-2} (b) L^2T^{-1} (c) $ML^{-1}T^{-1}$ (d) $ML^{-2}T^{-2}$

7. Impulse turbine is used for

(a) low head (b) high head (c) medium head (d) high flow

8. Cavitation is caused by

(a) high velocity (b) high pressure (c) weak material (d) low pressure

9. For pumping viscous oil, which pump will be used

(a) centrifugal pump (b) reciprocating pump
(c) turbine pump (d) screw pump

10. A double acting reciprocating pump compared to single acting pump will have nearly

(a) double efficiency (b) double head
(c) double flow (d) double weight

PART - B (5 x 2 = 10 Marks)

11. Define Newton's law of viscosity.

12. Distinguish between hydraulic and energy gradients.

13. Define Reynolds number.

14. List the functions of draft tube.

15. Define slip of reciprocating pump.

PART - C (5 x 16 = 80 Marks)

16. (a) Determine the torque, power required to turn 0.12 *cm* long 6 *cm* diameter shaft at 500 *rpm* in a 6.2 *cm* concentric bearing flooded with a lubricating oil of viscosity 0.1 Ns/m^2. (100centipoise). (16)

Or

(b) Obtain an expression for continuity equation for a three dimension flow. (16)

17. (a) Derive Hagen-Poiseuille equation and state the assumptions made. (16)

Or

(b) Derive Euler's equation of motion along a steam line for an ideal fluid and derive Bernoulli's equation from Euler's equation. (16)

18. (a) Find an expression for the drag force on smooth sphere of diameter D, moving with a uniform velocity V in a fluid of density ρ and dynamic viscosity μ using Rayleigh method. (16)

Or

(b) The efficiency η of a depends on density ρ, dynamic viscosity μ of the fluid, angular viscosity ω, diameter D of the rotor and discharge Q. Express η in terms of dimensionless parameters using Buckingham's π theorem. (16)

19. (a) Explain the working principle of centrifugal pump with neat sketch. (16)

Or

(b) The penstock supplies water from a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2.0 m^3/s. The angle of deflection of the jet is 165^o. Determine the power given by the water to the runner and also hydraulic efficiency of the Pelton wheel. Take speed ratio = 0.45 and C_v =1.0. (16)

20. (a) Illustrate the working principle of external gear pump with a neat sketch. Also mention its advantages and disadvantages. (16)

Or

(b) Discuss about the following types of rotary pumps with neat sketches. (i) Gear pump (ii) Lobe pump (iii) Vane pump. (16)

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