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**Reg. No. :**

**Question Paper Code: 43074**

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

Third Semester

Mechanical Engineering

14UME304 - FLUID MECHANICS AND MACHINERY

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Capillary rise or fall

(a) are noticed only in very smooth tubes (b) are due to surface tension of the liquid and the tube material (c) depends upon the pressure of the surroundings (d) does not depend upon the tube material

2. A fluid in which resistance to deformation is independent of the shear stress is known as

(a) Pseudo plastic fluid (b) Bingham plastic fluid (c) Dilatant fluid (d) Newtonian fluid

3. A point, in a fluid flow where the velocity of fluid is zero is called

(a) Critical point (b) Vena contract

(c) Stagnation point (d) Static point

4. Navier stokes equation represents the conservation of

(a) Mass (b) Momentum (c) Energy (d) Pressure

5. The dimension for torque is

(a) *ML2T-2*(b) *ML-2T-2* (c) *ML-1T-2* (d) *ML-1T-2*

6. Euler’s number relates

(a) Pressure force & Viscous force (b) Inertia force & elastic force (c) Inertia force & gravity force (d) Inertia force & pressure force

7. If the specific speed of a turbine is more than 300, the type of turbine is

(a) Pelton (b) Francis (c) Kaplan (d) Pelton with more jets

8. A hydraulic turbine working under a head of 16 m develops 640 *kW* power. The unit power of the turbine is

(a) 10 *kW*  (b) 40 *kW* (c) 60 *kW* (d) 160 *kW*

9. Cavitation can take place in case of

(a) Pelton Wheel (b) Francis Turbine (c) Centrifugal Pump (d) Both B and C

10. In axial flow turbines fluid enters and leaves as follows

(a) Radially, axially (b) Axially, axially (c) Axially, radially (d) Combination of axial & radial

PART - B (5 x 2 = 10 Marks)

11. List the types of fluid flow.

12. List out the minor energy losses in pipe.

13. State the methods of dimensional analysis.

14. Differentiate between impulse turbine and reaction turbine.

15. Define coefficient of discharge of reciprocating pump.

PART - C (5 x 16 = 80 Marks)

16. (a) A plate having an area of 0.6 *m2* is sliding down the inclined plane at 30*º* to the horizontal with a velocity of 0.36 *m/s*. There is a cushion of fluid 1.8 *mm* thick between the plane and the plate. Find the viscosity of the fluid if the weight of the plate is 280 *N*. (16)

Or

(b) The diameter of a pipe at the section 1-1 and 2-2 are 200 *mm* and 300 *mm* respectively. If the velocity of water flowing through the pipe at section 1-1 is 4 *m/s,*find

(i) Discharge through the pipe and

(ii) Velocity of water at section 2-2. (16)

17. (a) State Bernoulli’s theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli’s equation and state the assumptions made. (16)

Or

(b) An oil of specific gravity 0.9 and viscosity 0.06 *poise* is flowing through a pipe of diameter 20 *cm* at the rate of 60 *lit/sec*. Find the head lost due to friction for a 500 *m* length of pipe and power required to maintain the flow. (16)

18. (a) The size of droplet(*d*) produced by liquid spray nozzle depends up on the nozzle diameter *D*, jet velocity *V*, liquid density *ρ* and viscosity *µ* and surface tension *σ*. Using Buckingham’s pi theorem, obtain the dimensionless parameters. (16)

Or

(b) Water is flowing through a pipe of diameter 30 *cm* at a velocity of 4 *m/s*. Find the velocity of oil flowing in another pipe of diameter 10 *cm*, if the condition of dynamic similarity is satisfied between the two pipes. The Viscosity of water and oil is given as 0.01 *poise* and 0.025 *poise*. The specific gravity of oil = 0.8. (16)

19. (a) Explain the working principle of Pelton turbine with neat sketch. (16)

Or

(b) A Kaplan turbine delivering 40 *MW* works under a head of 35 *m* and runs at 167 *rpm*.

The hub diameter is 2.5 *m* and runner tip diameter is 5 *m*. The overall efficiency is

87*%*. Determine the blade angles at the hub and tip and also at a diameter of 3.75 *m*.

Also find the speed ratio and flow ratio based on tip velocity. Assume *ηH =* 90*%*. (16)

20. (a) Explain the working principle of lobe pump and vane pump with a neat sketch. (16)

Or

(b) What is reciprocating pump? Describe the principle and working of a reciprocating pump with neat sketch. (16)