A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 53704

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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. The unit of relative density of a liquid CO1- R

   (a) kg/m^3 (b) kN/m^3 (c) Pa (d) No Units.

2. The reason for the water droplets in the shape of sphere. CO1- R

   (a) Surface Tension (b) Density (c) capillary (d) gravity

3. The critical value for Reynold's number for the turbulent flow through pipes is CO2- R

   (a) Above 400 (b) Above 4000 (c) Below 400 (d) 0

4. The major losses in flow through tubes are due to CO2- R

   (a) Pipe fittings (b) Friction (c) Bending of pipes (d) All of these

5. Reynold's number is the ratio of ---------- to viscous CO3- R

   (a) Inertia force (b) Gravity force (c) Elastic force (d) Pressure force

6. The dimension of angular velocity is CO3- R

   (a) T^{-1} (b) MT^{-1} (c) LT^{-1} (d) MLT^{-1}

7. The pelton wheel is --------- type of turbine CO4- R

   Radial flow (b) Tangential Flow (c) Mixed flow (d) All of these

8. Draft tubes are used to discharge water from the exit of CO4- R

   (a) Impulse turbine (b) Francis turbine (c) Reciprocating pump (d) Centrifugal pump

9. Cavitation takes place in CO5 -R

(a) Pelton wheel (b)Centrifugal pump (c) Reciprocating pump (d) IFR turbine

10. Slip in reciprocating pump is the ---------- of theoretical discharge and actual discharge CO5- R

(a) sum (b) difference (c) product (d) ratio

PART – B (5 x 2= 10Marks)

11. Explain Newton's law of Viscosity. CO1 -R

12. What do you mean by turbulent flow? CO2 -R

13. State Buckingham's π theorem. CO3 -R

14. What is draft tube? CO4 -R

15. Define slip of a reciprocating pump. CO5 -R

PART – C (5 x 16= 80Marks)

16. (a) The dynamic viscosity of the oil, used to lubricate the space between shaft and sleeve is 6 poise. The shaft is 400 mm in diameter and rotating at 190 rpm. Determine the power lost in the bearing for a sleeve length of 90 mm. Thickness of the oil film is 1.5 mm. CO1- App (16)

Or

(b) A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/sec. Determine the discharge in this pipe. Also find the velocity in 15 cm pipe if the average velocity in 20cm diameter pipe is 2 m/sec. CO1- App (16)

17. (a) Derive the Bernoulli's equation from the Euler's equation and mention its assumptions. CO2- App (16)

Or

(b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170m and 210m and of diameters 300mm, 200mm and 400mm respectively, is 12m. Determine the rate of flow of water through the pipe if co-efficient of friction is 0.005, 0.0052 and 0.0048 respectively, neglecting minor losses in the pipes. CO2- Ana (16)

18. (a) Explain the similarity analysis used in the hydraulic system design in detail. CO3- Ana (16)

Or

(b) The frictional torque T of a disc of diameter (D) rotating at a speed (N) in a fluid of viscosity (μ) and density (ρ) in a turbulent flow is given by CO3- Ana (16)

$$T = D^5 N^2 \rho \, \emptyset \left[\frac{\mu}{D^2 N \rho}\right]$$

19. (a) Explain the working principle of Pelton wheel with a help of neat sketch. Also draw the velocity triangles of it and indicate the direction of various velocities. CO4- U (16)

Or

(b) A centrifugal pump discharges 0.15 m^3 /s of water against a head of 12.5 m when rotates at a speed of 600 rpm. The outer and inner diameters of impeller are 500 mm and 250 mm respectively and the vane angles are curved back at an angle of 35° to the tangent at exit. If the flow area remains 0.07 m^2 from inlet to exit , determine the manometric efficiency and vane angle at inlet. CO4- Ana (16)

20. (a) Explain with a neat sketch, the working of single acting reciprocating pump and also obtain the expression for weight of water delivered by the pump per second. CO5- U (16)

Or

(b) A double acting reciprocating pump, running at 40 rpm is discharging 1.0 m^3 of water per minute. The pump has a stroke of 400 mm and the diameter of the piston is 200 mm. The suction and delivery head are 20 m and 5 m respectively. Determine the slip, co-efficient of discharge and power required to drive the pump. CO5- U (16)

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