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

Question Paper Code: 43704

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Third Semester

Mechanical Engineering

14UME304 - FLUID MECHANICS AND MACHINERY

(Regulation 2014)

Duration: One hour Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

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 stream line is a line

   (a) which is along the path of a particle
   (b) which is always parallel to the main direction of flow
   (c) across which is no flow
   (d) on which tangent drawn at any point gives the direction of velocity

3. Navier stokes equation represents the conservation of

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

4. The following instruments are used in the measurement of discharge through a pipe: 1. Orifice meter, 2. Flow nozzle and 3. Venturimeter. Decreasing order of use

   (a) 1, 3, 2 (b) 1, 2, 3 (c) 3, 2, 1 (d) 2, 3, 1

5. Reynold's number is given by

(a) Viscous force / Inertial force (b) Inertial force / Viscous force
(c) Gravitational force / Viscous force (d) Pressure force / Viscous force

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. A draft tube is used with

(a) Centrifugal pump (b) Axial flow pump
(c) Reaction turbine (d) Reciprocating compressor

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 (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. What are the gauge pressure and absolute pressure at a point 3 m below the free surface of a liquid having a density of 1.53 X 10^3 kg/m^3, if the atmospheric pressure is equivalent to 750 mm of mercury? The specific gravity of mercury is 13.6 and density of water is 1000 kg/m^3. (8)

12. State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation and state the assumptions made. (8)

13. Using Buckingham's π- theorem, show that the velocity through a circular orifice in a pipe is given by $v = \sqrt{(2gH)}\ f\ \{d/H\ ,\ \mu/\rho vH\}$ where v is the velocity through orifice of diameter d and H is the head causing the flow and ρ and μ are the density and dynamic viscosity of the fluid passing through the orifice and g is acceleration due to gravity. (8)

14. A Pelton turbine running at 720 *rpm* uses 300 *kg* of water per second. If the head available is 425 *m*, determine the hydraulic efficiency. The bucket deflect the jet by 165°. Also determine the diameter of the runner and jet. Assume C_v = 0.97 and Φ = 0.46, Blade velocity coefficient is 0.9. (8)

15. The following details refer to a centrifugal pump. Outer diameter: 30 cm, Eye diameter: 15 cm, Blade angle at inlet: 30°, Blade angle at outlet: 25° and Speed 1450 rpm. The flow velocity remains constant. The whirl at inlet is zero. Determine the work done per kg. If the nanometric efficiency is 82%, determine the working head. If width at outlet is 2 cm, determine the power η_o = 76%. (8)