



B.E DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2009)

Third Semester

MECHATRONICS ENGINEERING

MCT103: Fluid Mechanics and Machinery

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A fluid is called an ideal fluid if it
 - a) obeys Newton's law of viscosity
 - b) has very small viscosity like air
 - c) moves without rotation
 - d) is compressible
2. Surface tension of a fluid
 - a) depends on the forces of molecular attraction
 - b) is inversely proportional to fluid density
 - c) is zero when the fluid is at rest
 - d) is the result of interaction between viscosity and atmospheric pressure
3. Stream line, path lines and streak lines are identical in
 - a) compressible flow
 - b) uniform flow
 - c) steady flow
 - d) highly viscous flow
4. Pitot tube is used to measure
 - a) quantity of fluid
 - b) central velocity of fluid
 - c) coefficient of discharge
 - d) coefficient of velocity
5. When the viscous fluid flowing through pipe, the shear stress is minimum at
 - a) walls of the pipe
 - b) centre of the pipe
 - c) entry of the pipe
 - d) exit of the pipe
6. For the laminar flow the Reynold number value is
 - a) between 2000 and 4000
 - b) between 4000 and 6000
 - c) less than 2000
 - d) more than 2000
7. Pelton turbine is
 - a) medium head turbine
 - b) low head turbine
 - c) high head turbine
 - d) high flow turbine
8. The inward flow reaction turbine having radial discharge at outlet is known as

component of velocity such that they satisfy the continuity equation:

$$(i) \quad u = x^2 + y^2 + z^2; v = xy^2 - yz^2 + xy$$

$$(ii) \quad v = 2y^2, w = 2xyz$$

(OR)

- b) In a vertical pipe conveying oil of sp.gr. 0.8, two pressure gauges have been installed at A and B where the diameters are 16 cm and 8 cm respectively. A is 2 m above B. The pressure gauge readings have shown that pressure at B is greater than at A by 0.981 N/cm^2 . Neglecting all losses, calculate the flow rate. If the gauges at A and B are replaced by tubes filled with the same liquid and connected to a U-tube containing mercury, calculate the difference of level of mercury in the two limbs of the U-tube.

23. a) For a flow of viscous fluid flowing through a circular pipe under laminar flow conditions show that the velocity distribution is a parabola. Also show that the average velocity is half to the maximum velocity.

(OR)

- b) A main pipe divides into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000m and 1m respectively, while the length and diameter of second parallel pipe are 2000m and 0.8m. Find the rate of flow in each parallel pipe, if total flow in the main is $3 \text{ m}^3/\text{sec}$. The co-efficient of friction for each parallel pipe is same and equal to 0.005.

24. a) A pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 litres/sec under a head of 30m. The buckets deflect the jet through an angle of 160° . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98.

(OR)

- b) As inward flow reaction turbine has external and internal diameters 1.0 and 0.6m respectively, the hydraulic efficiency of the turbine is 90% when the head on the turbine is 36m. The velocity of flow at outlet is 2.5m/s and discharge at outlet is radial. If the vane angle at outlet is 15° and width of the wheel is 100mm at inlet and outlet, determine: a) the guide blade angle, b) Speed of the turbine, c) Vane angle of runner at inlet, d) Volume flow rate of turbine

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) The length and diameter of a suction pipe of a single acting reciprocating pump are 5m and 10 cm respectively. The pump has a plunger of diameter 15 cm and a stroke length of 35 cm. The centre of the pump is 3m above the water surface in the pump. The atmospheric pressure head is 10.3 m of water and pump is running at 35 r.p.m. Determine: (i) Pressure head due to acceleration at the beginning of the suction stroke, (ii) Maximum pressure head due to acceleration, and (iii) Pressure head in the cylinder at the beginning and at the end of the stroke.
