KUMARAGURU
college of technology
character is life

Register Number: ……..

B.E DEGREE EXAMINATIONS: DEC 2014

(Regulation 2009)

Third Semester

MECHATRONICS ENGINEERING

MCT 103: Fluid Mechanics and Machinery

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Poise is the unit of
   a) pressure b) viscosity
   c) density d) velocity
2. Gauge pressure at a point is _____ pressures
   a) absolute + atmospheric b) absolute - atmospheric
   c) vacuum + atmospheric d) vacuum - atmospheric
3. Continuity equation deals with the law of conservation of
   a) mass b) flow
   c) momentum d) energy
4. Pitot-tube is used for measurement of
   a) flow b) pressure
   c) velocity at a point d) discharge
5. The loss of pressure head for the laminar flow through pipe varies
   a) directly as the velocity b) as the square of velocity
   c) as the inverse of velocity d) as the cube of velocity
6. A pipeline is said to be equivalent to another if
   a) length and discharge are the same b) velocity and diameter are the same
   c) discharge and frictional head loss are the same d) length and diameter are the same

7. Francis turbine is

a) an impulse turbine
b) a radial flow impulse turbine
c) an axial flow turbine
d) a radial flow reaction turbine

8. Unit speed is the speed of a turbine when it is working

a) under unit head and develops unit power
b) under unit head
c) under unit head and discharge one m^3/s
d) under unit discharge

9. Which of the following pump is suitable for small discharge and high heads?

a) Centrifugal pump
b) Axial pump
c) Mixed flow pump
d) Reciprocating pump

10. During delivery stroke of a reciprocating pump, the separation takes place

a) in the beginning of the delivery stroke
b) in the middle of delivery stroke
c) at the end of delivery stroke
d) at the end of non return valve

PART B (10 x 2 = 20 Marks)

11. Define hydrostatic law.
12. Find the surface tension in a soap bubble of 40 mm diameter when the inside pressure is 2.5 N/m^2 above atmospheric pressure.
13. What do you mean by source flow?
14. Enumerate the assumptions of Bernoulli's equation.
15. Which dimensionless number is used to indicate the viscous flow also quantify it?
16. Name the concepts used in study of flow through fluids through pipes.
17. Distinguish between axial and radial flow turbine.
18. What is degree of reaction?
19. Mention the parts of a centrifugal pump.
20. How the reciprocating pumps are classified based on number of cylinders?

PART C (5 x 14 = 70 Marks)

21. a) (i) The dynamic viscosity of oil used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90 m. The thickness of the oil film is 1.5 mm (8)

(ii) With the help of neat sketch, explain the working principle of bourdon pressure gauge. (6)

(OR)

b) (i) Calculate the specific weight, density and specific gravity of one liter of a liquid which weighs 7 N. (7)

(ii) Classify the single column manometer and discuss in detail about it. (7)

22. a) (i) A jet of water from a 25 mm diameter nozzle is directed upwards. Assuming that the jet remains circular and neglecting any loss of energy, which will be the diameter at a point 4.5 m above the nozzle, if the velocity with which the jet leaves the nozzle is 12 m/s. (10)

(ii) Specify the different types of flow. (4)

(OR)

b) (i) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation. (10)

(ii) A pitot-static tube is used to measure the velocity of water in a pipe. The stagnation pressure head is 6 m and static pressure head is 5 m. Calculate the velocity of flow assuming the co-efficient of tube equal to 0.98. (4)

23. a) (i) Find the head lost due to friction in a pipe of diameter 300 mm and 50 m length, through which water is flowing at a velocity of 3 m/s using (10)

Darcy's formula assume f =0.005

Chezy's formula assume c = 55

Assume kinematic viscosity of water = 0.01 stroke

(ii) What is meant by minor loss of energy? Name any four possibilities. (4)

(OR)

b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, is 12 m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.648 respectively, considering minor losses and neglecting minor losses.

24. a) (i) Enumerate in detail about the various efficiencies of turbine. (8)

(ii) A turbine develops 9000 kW when running at a speed of 140rpm and under a head of 30 m. Determine the specific speed of the turbine. (6)

(OR)

b) A Pelton wheel is to be designed for the following specifications

Shaft power = 95.6475 kW

Head = 60 m

Speed = 200 rpm

Overall Efficiency = 85%

Velocity of buckets = 0.45 times the velocity of the jet

Determine

Velocity of jet if $C_v = 0.98$

Diameter of the jet

Diameter of wheel

Width and depth of bucket

Number of buckets on the wheel

25. a) (i) Distinguish between Centrifugal pump and Reciprocating pump. (8)

(ii) A single acting reciprocating pump has a plunger of 300mm diameter and stroke 200 mm. If the speed of the pump is 30 rpm & it delivers 6.5 liters / sec of water. Find the C_d and % of slip of the pump. (6)

(OR)

b) (i) A Centrifugal pump delivers 30 liters of water per second to a height of 18 m through a pipe of 90 m long and 100m diameter. If overall efficiency of the pump is 75%. Find the power required to drive the pump take f 0.012 (12)

(ii) Why the priming is needed in centrifugal pump? (2)

****