KUMARAGURU
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Register Number: ………………..

B.E DEGREE EXAMINATIONS:MAY 2015

(Regulation 2013)

Third Semester

MECHATRONICS ENGINEERING

U13MCT304: Mechanics of Fluids For Mechatronics

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The property of a liquid which offers resistance to the movement of one layer of liquid over another adjacent layer of liquid is called

    a) Surface tension   b) Compressibility

    c) Capillarity   d) Viscosity

2. A manometer is used to…………. measurement.

3. Bernoulli's equation is applied to

    a) Venturimeter   b) Orifice meter

    c) Pitot tube   d) All of these

4. A flow, in which the quantity of liquid flowing per second is constant, is called ………. flow

5. The flow in a pipe is neither laminar nor turbulent when Reynolds's number is

    a) Less than 2000   b) Between 2000 – 2800

    c) Between 2800 – 3000   d) More than 3000

6. A nozzle is generally made of ……. shape

7. The impulse turbine is used for

    a) Low head of water   b) High head of water

    c) Medium head of water   d) High discharge

8. The overall efficiency lies between …....... for a Pelton wheel.

9. Multi stage centrifugal pumps are used to

    a) Give high discharge   b) Produce high heads

    c) Pump viscous fluids   d) All of these

10. …………. is suitable for small discharge and high heads

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. Define Pascal's law.

12. State the Newton's law of viscosity.

13. Distinguish between the steady flow and unsteady flow.

14. What is Euler's equation of motion? How will you obtain Bernoulli's equation from it?

15. Classify the different losses in the pipes.

16. Write down the Darcy formula for energy loss due to friction.

17. Mention the different types of efficiency in turbine.

18. Write down the different characteristics curves of a turbine.

19. Define specific speed of a centrifugal pump.

20. Differentiate between the centrifugal pump and reciprocating pump.

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. The right limb of a simple U- tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of the fluid flowing in the pipe if the difference of mercury level in the two limbs is 20 cm.

22. a) Explain the different types of fluids flow with suitable example.

(OR)

b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow. Take C_d= 0.98.

23. a) Determine i) the pressure gradient, ii) the shear stress at the two horizontal parallel plates and iii) the discharge per metre width for the laminar flow of oil with a maximum velocity of 2 m/s between two horizontal parallel fixed plates which are 100 mm apart. Given μ = 2.4525 N s/m^2.

(OR)

b) The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2. Determine : i) Loss of head due to sudden enlargement ii) Pressure intensity in the large pipe iii) Power lost due to enlargement.

24. a) A pelton wheel is to be designed for the following specifications: shaft power = 11,772 kW; Head = 380 m; Speed = 750 r.p.m.; Overall efficiency = 86 %; Jet diameter is not to exceed one-sixth of the wheel diameter. Determine i) The wheel diameter ii) The number of jets required and iii) Diameter of the jet. Take Speed ratio = 0.45 and Coefficient of velocity = 0.985.

(OR)

b) The hub diameter of a Kaplan turbine, working under a head of 12 m, is 0.35 times the diameter of the runner. The turbine is running at 100 r.p.m. if the vane angle of the extreme edge of the runner at outlet is 15 degree and flow ratio is 0.6, find: i) Diameter of the runner ii) Diameter of the boss iii) Discharge through the runner. The velocity of whirl at outlet is given as zero.

25. a) Define a centrifugal pump. Explain the main parts of a centrifugal pump with neat sketches.

(OR)

b) A single acting reciprocating pump, running at 50 r.p.m., delivers 0.01 m^3/s of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine: i) The theoretical discharge of the pump ii) Co efficient of discharge and iii) Slip and the percentage slip of the pump.

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