KUMARAGURU
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B.E DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2009)

Third Semester

MEC106: FLUID MECHANICS AND MACHINERY

(Common to AE/AUE/ME)

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1.   The ratio of weight of the fluid to its volume is known as

    a)   Mass density   b)   specific weight

    c)   specific volume   d)   specific gravity

2.   The unit of kinematic viscosity is

    a) Ns/m^2 b)   Poise

    c)   N/s   d) m^2/s

3.   The pitot tube is used to measure the

    a)   Velocity of the fluid   b)   Flow rate of the fluid

    c)   Pressure of the fluid   d)   Viscosity of the fluid

4.   The type of flow in which the velocity at any given time changes with respect to space is known as

    a)   Uniform flow   b)   Non-uniform flow

    c)   unsteady flow   d)   Turbulent flow

5.   The shear stress in a round pipe with a laminar flow in it

    a)   Remains constant over the cross section   b)   Varies inversely as the distance from the mid-plane

    c)   Varies directly as the distance from the mid-plane   d)   Varies parabolically across the cross-section

6.   Friction loss through a pipe implies

    a)   Loss of energy due to static coefficient of friction   b)   Loss of energy due to dynamic coefficient of friction

    c)   Loss of flow rate in a pipe due to surface roughness   d)   Loss of energy due to surface roughness

7. The ratio of power delivered to runner to power supplied by the water at inlet of the turbine is known as
   a) hydraulic efficiency
   b) mechanical efficiency
   c) volumetric efficiency
   d) overall efficiency

8. If the water flows from outwards to inwards, radially, the turbine is known as
   a) Inward radial flow turbine
   b) Outward radial flow turbine
   c) Axial flow turbine
   d) Mixed flow turbine

9. The head against which a centrifugal pump has to work is known as
   a) Suction head
   b) Delivery head
   c) Static head
   d) Manometric head

10. The ratio of power available at the impeller to the power at the shaft of the centrifugal pump is known as
    a) manometric efficiency
    b) volumetric efficiency
    c) mechanical efficiency
    d) overall efficiency

PART B (10 x 2 = 20 Marks)

11. Differentiate between ideal and real fluids.

12. Define surface tension.

13. Define stream function.

14. What is meant by 'flow net'?

15. What is the use of Moody's diagram?

16. Mention any 4 minor losses in pipe lines.

17. Define specific speed of the turbine.

18. Differentiate between impulse turbine and reaction turbine.

19. Classify pumps.

20. What is meant by cavitations in pumps?

PART C (5 x 14 = 70 Marks)

21. a) The dynamic viscosity of an 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 mm. The thickness of the oil film is 1.5 mm.

(OR)

b) i) Differentiate between absolute pressure and gauge pressure. (4)

   ii) Calculate the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in a) water b) mercury. Take surface tension as 0.0725 N/m for water (10) and 0.52 N/m for mercury in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact = 130^0

22. a) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm

is used to measure the flow of water. The pressure at inlet is 17.658N/cm^2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through venturimeter. Take C$_d$ = 0.98.

(OR)

b) The pressure difference ΔP in a pipe of diameter D and length l due to turbulent flow depends on the velocity V, viscosity μ, density ρ and roughness k. Using Buckingham's π theorem, obtain an expression for ΔP.

23. a) Derive Hagen Poiseuille formulae for the flow of viscous fluid through circular pipe.

(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 3m^3/s. 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 metres per second with a jet of water flowing at the rate of 700 litres/second under a head of 30 metres. The buckets deflect the jet through an angle of 160^0. 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) A Kaplan turbine runner is to be designed to develop 9100kW. The net available head is 5.6m. If the speed ratio = 2.09, flow ratio = 0.68, overall efficiency = 86% and the diameter of the boss is 1/3 the diameter of the runner, Find the diameter of the runner, its speed and the specific speed of the turbine.

25. a) A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 rpm against a head of 25m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.

(OR)

b) What is a reciprocating pump? Describe the working principle of a reciprocating pump with neat sketch.

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