

ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : JAN – FEB 2009

REGULATIONS : 2007

SECOND SEMESTER

070120003 / 4MC1202 - FLUID MECHANICS & MACHINERY

(COMMON TO MECH / METAL / AERO / MECHATRONICS / AUTOMOBILE ENGG.)

Time : 3 Hours

Max: 100 Marks

PART - A

(20 x 2 = 40 Marks)

ANSWER ALL QUESTIONS

1. Convert 1 kg/s-m dynamic viscosity in poise.
2. What is the effect of temperature on viscosity of water and that of air?
3. Define surface tension.
4. Differentiate between absolute and gauge pressure.
5. What do you mean by equipotential line and a line of constant stream function?
6. Define stream line and streak line in a fluid flow.
7. Name the different forces present in a fluid flow.
8. What is pitot-static tube?
9. Distinguish between laminar flow and turbulent flow.
10. Sketch the shear stress distribution curve for a viscous flow through circular pipes.
11. Define the terms total energy line and hydraulic gradient line.
12. Give an expression to determine the loss of head due to bend in pipe.
13. Differentiate between impulse and reaction turbines.
14. Define hydraulic efficiency of a turbine.
15. What is meant by speed ratio and jet ratio of a Pelton wheel?
16. What is a draft tube? What is its function?
17. Draw a sketch of Kaplan turbine runner?
18. What is meant by Net Positive Suction Head (NPSH)?

19. Define slip of a reciprocating pump.
20. Define indicator diagram.

PART - B

(5 x 12 = 60 Marks)

ANSWER ANY FIVE QUESTIONS

21. An inverted U-tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these points is 30cm. When an oil of specific gravity 0.8 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective centre lines of the pipes) are found to be same and equal to 35 cm. Determine the difference of pressure between the pipes. (12)
22. Find the convective acceleration at the middle of a pipe which converges uniformly from 0.6 m diameter to 0.3 m diameter over 3 m length. The rate of flow is 40 lit/s. If the rate of flow changes uniformly from 40 lit/s to 80 lit/s in 40 seconds, find the total acceleration at the middle of the pipe at 20th second. (12)
23. A pipeline carrying oil (sp. gr. = 0.87) changes in diameter from 200 mm diameter at position '1' to 500 mm diameter at position '2' which is 4 m at a higher level. If the pressure at '1' and '2' are 100 kN/m² and 60 kN/m² respectively and the discharge is 0.2 m³/s, determine the loss of head and direction of flow. (12)
24. Derive Hagen Poiseuille's equation for a flow through the circular pipe. (12)

25. A horizontal pipe of 400 mm diameter is suddenly contracted to a diameter of 200mm, the pressure intensities in the large and smaller pipe is given as 15 N/cm² and 10 N/cm² respectively. Find the loss of head due to contraction, if $C = 0.61$, determine also the rate of flow of water. (12)
26. With the help of a neat diagram explain the construction and working of a Pelton wheel turbine. Derive an expression for hydraulic efficiency of a Pelton wheel. (12)
27. An inward flow reaction turbine works at 450 rpm under a head of 120 m. Its diameter at inlet is 1.2 m and the flow area is 0.4 m². The angles made by absolute and relative velocities at inlet are 20° and 60° with the tangential velocity. Determine (i) the volume flow rate, (ii) the power developed in the turbine and (iii) the hydraulic efficiency. (12)
28. (i) How will you obtain an expression for the minimum speed for starting a centrifugal pump? (6)
- (ii) A double acting reciprocating pump, running at 40 rpm is discharging 1 m³ of water per minute. The pump has a stroke of 400 mm. The diameter of the piston is 200 mm. The delivery and suction head are 20 m and 5 m respectively. Find the slip of the pump and power required to drive the pump. (6)

*****THE END*****