QUESTION BANK

DEPARTMENT : MECHANICAL SEMESTER : III

SUBJECT NAME: FLUID MECHANICS AND MACHINERY

UNIT I- INTRODUCTION

PART – A (2 Marks)

01. Why are some fluids classified as Newtonian fluid? Give examples to Newtonian fluids. **(NOV'2)**
02. What is specific gravity? How is it related to density? **(Apr'08)**
03. Define the term pressure .What are its units? **(Dec'05)**
04. State Pascal's law? **(Dec'05 & Dec'08)**
05. What is meant by stagnation pressure? **(Dec'08)**
06. What is the difference between gauge pressure and absolute pressure? **(Dec'07)**
07. Define compressibility and viscosity of a fluid? **(Apr'05)**
08. State the Newton's law of viscosity? **(Apr'04)**
09. What is viscosity? What is the cause of it in liquids and in gases? **(Apr'04)**
10. What is the effect of temperature on viscosity of water and that of air? **(Nov'04)**
11. Define capillarity? **(Dec'05)**
12. Explain the effect of property of capillarity **(Nov'04)**
13. Express 3m of water head in cm of mercury and pressure in Kpa? **(Apr'03)**
14. What are the three major assumptions made in the derivation of the Bernoulli's equation? **(Apr'03)**
15. Mention any three applications of bernouills equation? **(Apr'05)**

PART-B (16 Marks)

01. Find the height through which water rises by capillary action in a 2mm bore, if surface tension at the prevailing temp is 0.075g/cm **(APR-03)**
02. Calculate the capillary rise in glass tube of 3mm dia when immersed in mercury take the surface tension and angle of contact of mercury as 0.52N/m and 130º respectively .Also determine the minimum size of the glass tube, if it is immersed in water, given that the surface tension of water is 0.0725N/m and the capillary rise in the tube is not to exceed 0.5mm. **(NOV-03)**

03. Calculate the capillary effect in the glass tube 5mm dia, when immersed in 1)WATER 2)MERCURY .The surface tension of water and the mercury in contact with air are 0.0725N/m and 0.51N/m respectively. The angle of contact of mercury is 130º.

(NOV-04) 04. A 1.9mm dia tube is inserted in to an unknown liquid whose density is 960 kg/m^3 and it is observed that the liquid is rises 5mm in the tube, making a contact angle of 15º. Determine the surface tension of the liquid. **(APR-08)**

05. A capillary tube having inside dia 6mm is dipped in CCl4 at 20ºc. Find the rise of CCl4 in the tube, if surface tension is 2.67N/m and the specific gravity is 1.594 and contact angle θ=60º and specific weight of water at 20ºc is 9981N/m^3 **(DEC-08)**

06. An oil film of thickness 10mm is used for lubrication between the two square parallel plates of size 0.9m×0.9m each, in which the upper plate moves at 2m/s required a force of 100N to maintain this speed. Determine,

1. Dynamic viscosity of oil 2. Kinematic viscosity of oil If the specific gravity of the oil is 0.95 **(NOV-03)**

07. The space between two square parallel plate is filled with oil. Each side of the plate is 75cm. The thickness of the oil film is 10mm. The upper plate which moves at 3M/s requires a force of 100N to maintain the speed. Determine

1. Dynamic viscosity of oil, 2. Kinematic viscosity of oil. If the specific gravity of oil is 0.9 **(NOV-04)**

08. If the velocity distribution of over a plate is given by $u = (2/3)Y - Y^2$ in which 'U' is the velocity in meter per second at a distance 'Y' meter above the plate , determine the shear stress at Y=0 and Y=0.15m the dynamic viscosity of fluid is 8.63 poises. **(DEC-03)**

09. The velocity distribution over a plate is given by $U = (3/4)\ Y - Y^2$ where U is the velocity in M/S and at the depth Y in m above the plate. Determine the shear stress at a distance of 0.3m from the top of plate. Assume dynamic viscosity of the fluid is taken as 0.95Ns/m^2.

(APR-05) 10. A fluid of specific velocity 0.9 flows along the surface with a velocity U=4Y-8Y^3 M/s where Y is in m, what is the velocity gradient at the boundary? If the kinematic viscosity is 0.36 S^.

What is the shear stress at the boundary?

11. A 200mm dia shaft slides through a sleeve 200.5mm dia and 400mm long, at a velocity of 30cm/s. The viscosity of the oil filling the annular space is = 0.1125Ns/m^2. Find the resistance to the motion
12. The maximum blood pressure in the upper arm of a healthy person is about 120mm of Hg if a vertical tube open to the atmosphere is connected to the vein in the arm of the person. Determine how high the blood will rise in the tube. Take the density of blood to be 1050Kg/m^3.
13. When a pressure of 20.7MN/M^2 is applied to 1000 lit of a liquid its volume decrease by one lit. Find the bulk modulus of the liquid and identify this liquid.
14. Assuming the bulk modulus of elasticity of water 2.07 × 10^6 KN/M^2 at standard atmospheric condition, determine the increase in pressure necessary to produce one percent reduction in the volume at the same temp
15. Calculate the pressure exerted by 5Kg of nitrogen gas at a temperature of 10ºc When the volume is 0.4m^3. Also find the volume when the pressure is 3×10^5 N/M^2 and the temp is 10ºc. Assume Ideal gas law is applicable.
16. A pipe containing water at 180KN/m^2 pressure is connected by a differential gauge to another pipe 1.6m lower than the first pipe and containing water at high pressure . If the difference in height of 2 mercury columns of the gauge is equal to 90mm, what is the pressure is the lower pipe?
17. An orifice meter with orifice dia 15cm is inserted in a pipe of 30cm dia the pressure on the upstream and downstream of orifice meter is 14.7N/cm^2 and 9.81N/cm^2 respectively. Find discharge (Take cd= 0.6)
18. Oil of specific gravity 0.85 issues from a 5cm dia orifice under a pressure 12N/cm^2 .The dia of jet at vena contract is 4cm and the discharge is 12.5lit/sec. What is co-efficient of velocity?
19. Oil flow through of 25mm dia orifice under a head of 5.5cm at a rate of 3lit/s. The jet strikes 1.5m away and 120mm vertically below the centre line of jet. Calculate the co-efficient of velocity, discharge, contraction.
20. An orifice meter consisting of 10cm orifice in a 25cm dia of pipe has a co-efficient 0.65. The pipe delivers oil of Specific gravity 0.8. The pressure difference between two sides of the orifice meter is 80cm of mercury column. Calculate flow rate in lit/sec.
21. Find the quantity of water flowing through a Venturimeter size 15cm x 15cm when the differential manometer connected between the inlet and throat of Venturimeter gives 6cm

22. A 250mm pipe carries oil (specific gravity= 0.8) at a velocity of 20m/s. At point A and B of measurement of pressure and elevation were respectively 100KN/m^2 and 60KN/m^2 , 5m and 8m respectively for steady flow .Find the loss of head between A and B and the direction of flow.

23. A Venturimeter with 200mm inlet dia and 100mm throat is laid with axis horizontal and is used for measuring the flow of oil of specific gravity 0.8 the difference of level in U-tube manometer reads 180mm of mercury, Whist 11520kg of oil is collected through meter is 4min. Calculate the discharge and Co-efficient of meter.

24. A 30cm x 15cm Venturimeter is provided in a provided in a vertical pipe line carrying oil of specific gravity 0.9, the flow being upward. The difference in elevation of the throat section and entrance section of Venturimeter is 30cm. The pressure difference in manometer is 25cm of Hg. Take Cd= 0.98. Calculate discharge of oil and pressure difference between entrance and throat.