# GYANMANJARI INSTITUTE OF TECHNOLOGY (GMIT)
## MECHANICAL ENGINEERING DEPARTMENT
## QUESTION BANK

SUBJECT CODE: **2141906** SUBJECT: **FLUID MECHANICS**

| Sr. No. | Detail | Year | Mark |
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| | **UNIT 1 Fluids and Their Properties** | | |
| 1. | Explain the continuum concept used in fluid mechanics | Dec-2009 | 2 |
| 2. | What do you understand by continuum concept of a fluid? | March-2010 | 3 |
| 3. | Explain difference between the behavior of solid and fluid under an applied force | Dec-2009 | 3 |
| 4. | With neat sketch write about Newtonian and non-Newtonian fluid | Dec-2009 | 2 |
| 5. | Define or explain following terms 1. Newton's law of viscosity 2. Capillarity | Jan-2016 | 2 |
| 6. | State Newton's law of viscosity and give an example. | Nov-2016 | 4 |
| 7. | Derive an expression for capillary rise (depression) between two vertical parallel plates | Dec-2009 | 3 |
| 8. | Define the capillarity and derive an expression for capillary rise h=4σ/ρgd where h=rise of water σ= surface tension of liquid ρ= density of liquid and d= diameter of droplet | March-2010 | 4 |
| 9. | What is fluid? How fluid is differing from solid? Define viscosity, surface tension, compressibility and vapour pressure. | Dec-2014 | 7 |
| 10. | Define the following terms: (I) Density (II) Weight density (III) Specific volume (IV) Viscosity (V) Kinematic viscosity (VI) Surface tension (VII) Capillarity | March-2010 | 7 |
| 11. | Explain the phenomenon of capillarity. Obtain and expression for capillary rise and capillary fall of a liquid | March-2010 | 7 |
| 12. | Answer the following (i) Define capillarity and develop a formula for capillary rise of a liquid between two concentric glass tubes with usual notations. (ii) State and explain Newton's law of viscosity. | Dec-2011 | 7 |
| 13. | What is the difference between dynamic viscosity and kinematic viscosity? State their units | May-2012 | 3 |
| 14. | Obtain an expression for capillary rise of liquid? | May-2012 | 4 |
| 15. | Define: Viscosity, Surface tension, Specific weight, Newtonian fluid, Ideal fluid | Jan-2013 | 5 |
| 16. | What is compressibility? Derive an expression for it? | May-2013 | 3 |
| 17. | Define following (any seven)<br>Density Dynamic viscosity Kinematic viscosity Capillary Bulk modulus of elasticity Surface tension Vapor presser Cavitation Cohesion Adhesion | May-2013 | 7 |
| 18. | Explain the following terms:<br>1. Relative density 2. Kinematic viscosity 3. Cavitation 4. Vapour pressure<br>5. Continuum 6. Compressibility 7. Capillary effect | May-2015 | 7 |
| 19. | A plate 0.05 mm distance from a fixed plate moves at 1.2 m/s and requires a force of 2.2 N/m2 to maintain this speed, find the viscosity of the fluid between the plates | May-2013 | 4 |
| 20. | A soap bubble 62.5 mm diameter has an internal pressure in excess of the outside pressure of 20 N/m2 . what is the tension in soap film? | May-2013 | 3 |
| 21. | Calculate the shear stress developed in oil of viscosity 1.2 poise, used for | May-2015 | 7 |

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| | lubricating the clearance between a shaft of diameter 12 cm and its journal bearing. The shaft rotates at 180 rpm and clearance is 1.4 mm. | | |
| 22. | At a depth of 9 km in the ocean, the pressure is 9.5*104 kN/m2. The specific weight of the ocean water at the surface is 10.2 kN/m3 and its average Bulk modulus is 2.4*106 kN/m2. Determine: - (i) The change in specific volume, (ii) The specific volume at 9 km depth and (iii) The specific weight at 9 km depth | March-2010 | 6 |
| 23. | A 150 mm diameter vertical cylinder rotates concentrically inside cylinder of diameter 151 mm. both the cylinders are 250 mm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12 Nm is required to rotate the inner cylinder at 100 rpm, determine the viscosity of the liquid. | Jan-2016 | 5 |
| 24. | A flate plate 30 cm X 50 cm slides on oil ( $\mu$ =0.8 N-s/$m^2$) over a large plane surfaces. What is the force required to drag the plate at 2 m/s if separating oil film is 0.1mm thick? | Dec-2009 | 4 |
| 25. | A disc of 100mm diameter rotates on table separated by an oil film of 2mm thickness. Find the torque required to rotate the disc at 60rpm, if dynamic viscosity of oil is 0.05 poise. Assume the velocity gradient in oil film tp be linear | Dec-2011 | 7 |
| 26. | The capillary rise in the glass tube is not exceed 0.4 mm of water determine its minimumm size =, given that surface tension for water in contact with air s=0.0725 N/m and conatct angle Ө=250 | Dec-2013 | 3 |
| 27. | Calculate the capilalry rise in a glass tube of 3mm diameter inserted in water. Surface tension for water is 0.075N/m. what will be the percentage increase in capillary height if the diameter of glass tube is 2mm | June-2015 | 7 |
| 28. | A 50mm diameter shaft rorates with 500 rpm in a 80 mm long journal bearing with 51 mm internal diamter. The annular space between the shaft and bearing is filled with lubricating oil of dynamic viscosity 1 poise. Determine the torque required and power absorbed to overcome friction | May-2014 | 7 |
| 29. | An oil of viscosity 4 poise is used for lubrication between a shaft and sleeve. The diameter of the shaft is 0.5m and it rotates at 250 rpm. Calculate the power lost in oil for a sleeve length of 100mm. the thickness of oil film is 1mm. | Dec-2014 | 7 |
| 30. | A rectangular plate, 1mX0.5m, weighing 980.7N slides down a 30 inclined surface at a uniform velocity of 2.0m/sec. if the 2mm gap between the plate and the inclined surface is filled with caster oil, determine the viscosity (in poise) of th castor oil | Dec-2013 | 7 |
| **UNIT 2 Pressures and Head** | | | |
| 1. | Prove that " intensity of pressure at any point in a fluid at rest is same in all direction | March-2010 | 4 |
| 2. | Enlist the various Mechanical gauges for pressure measurement and describe their working with suitable diagram. | Dec-2016 | 9 |
| 3. | What do you mean by gauge pressure, vacuum pressure and absolute pressure? Explain the working principle of U-tube differential manometer with neat sketch | Dec-2010 | 7 |
| 4. | Explain with neat diagram construction and working of bellow and diaphragm pressure gauge. | Nov-2016 | 7 |
| 5. | Explain with neat diagram construction and working of bourdon tube pressure gauge | Nov-2016 | 7 |
| 6. | State advantages and limitation of manometer | Nov-2016 | 3 |
| 7. | State and prove pascal's law for static fluid | Dec-2010<br>Dec-2012<br>Jun-2015 | 4<br>4<br>4 |

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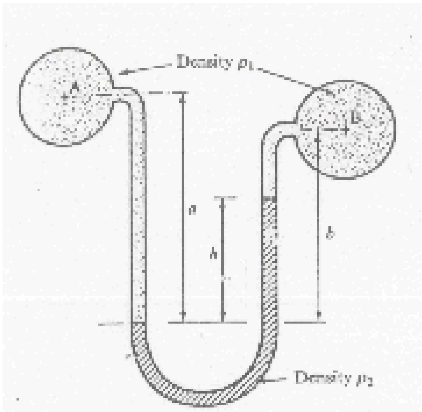
| | | Jun-2016 | 4 |
| 8. | State and prove pascal’s law for static fluid. Also mention its application | May-2011 | 7 |
| 9. | State pascal’s law and hydrostatic law | Dec-2011 | 7 |
| 10. | Describe vertical single column manometer? How will you measure the fluid pressure with it? | May-2012 | 4 |
| 11. | Enlist types of manometers. Differentiate between simple manometer and differential manometer | Dec-2012 | 7 |
| 12. | Define atmospheric pressure gauge pressure and absolute pressure. State and prove pascal’s law with usual notations | May-2013 | 7 |
| 13. | Define manometer. List different types of manometer. Explain single column manometer with usual notations. State advantages and limitation of manometer | May-2013 | 7 |
| 14. | Explain bourden tube pressure gauge | May-2013 | 7 |
| 15. | Enlist different types of manometers and explain the working of a differential U-tube manometer | Dec-2013 | 7 |
| 16. | Distinguish between absolute “absolute pressure “and gauge pressure. An open tank contains water up to a depth of 2m and above it, oil of specific gravity 0.9 for 1m depth. Find pressure at bottom of the tank | Dec-2013 | 4 |
| 17. | State and discuss : hydrostatic law of pressure variation | Dec-2013 | 3 |
| 18. | State pascal law. Also prove that pressure at same level in static fluid is equal | May-2014 | 3 |
| 19. | A U – tube manometer (Fig ) measures the pressure difference between two points A and B in a liquid of density ρ1 . The U-tube contains mercury of density ρ2 . Calculate the difference of pressure between points A and B if the liquid contain at A is water. Take a= 1.5m, b = 0.75m and h= 0.50 m  | Dec-2009 | 3 |
| 20. | A U-tube manometer is used to measure the pressure of water in a pipe line, which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of water in the main line, if the difference in level of mercury in the limbs of U-tube is 12cm and the free surface of mercury is in level with the centre of the pipe. If the pressure of water in pipe line is reduced to 9810 N/m2. Calculate the new difference in the level of mercury. | Mar-2010 | 7 |
| 21. | The left limb of a u-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.85 is flowing. The right limb is open to atmosphere. Mercury levels in the left and right limbs are 0.12 m and 0.4 m below center of the pipe respectively. Calculate the vacuum pressure in the pipe. Also express this vacuum pressure in terms of: i) absolute pressure and, ii) m of water. | Jan-2013 | 7 |

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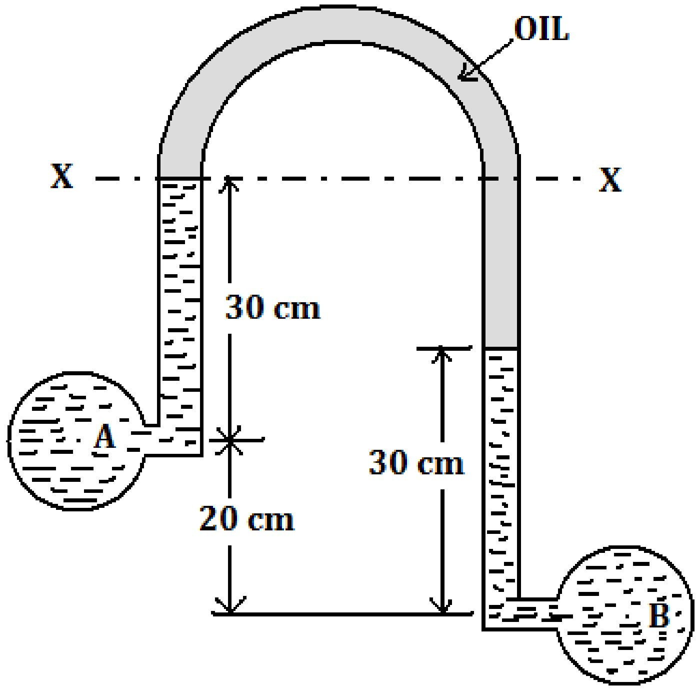
| | Take atmospheric pressure as 101.3 KN/m2 and specific gravity of mercury as 13.6. | | |
| 22. | Find the depth of point below sea water surface where the pressure intensity is 404.8 kN/m2. The specific gravity of sea water is 1.03. | Jun-2015 | 3 |
| 23. | An open tank contains water up to depth of 2m and above it oil of specific gravity 0.9 for 1m depth find the pressure at the bottom of the tank | Nov-2013 | 3 |
| 24. | An inverted differential manometer is connected with two pipes A and B in which water is flowing as shown in fig. 1.The menometric fluid is oil of specific gravity 0.8. Refer the figure and find the pressure difference between A and B.   | Dec-2014 | 7 |
| | **UNIT 3 Static Forces on Surface and Buoyancy** | | |
| 1. | Explain force on a curved surface due to hydrostatic pressure. Derive an expression of resulting horizontal, vertical and resultant forced on curve surfaced immersed in a liquid | March-2010 | 6 |
| 2. | Define following terms: (1) Total pressure (2)centre of pressure (3) force of buoyancy (4) metacentre | Dec-2010 | 4 |
| 3. | Derive the expression of total pressure and centre of pressure for a vertical plate submerged in the liquid with usual notations | Dec-2010 | 5 |
| 4. | A solid cylinder of diameter 4m has a height of 4m. find the metacentric height of the cylinder if the specific gravity of the material of cylinder is 0.7 and it is floating in water with its axis vertical. State whether the equilibrium is stable or unstable | Dec-2010 | 5 |
| 5. | Explain the condition of stability for a submerged body | Dec-2010 | 3 |
| 6. | Show that the distance between the meta centre and center of buoyancy is given by BM=I/V̶ | May-2011<br>Jun-2015 | 7<br>7 |
| 7. | Prove that the centre of pressure for any immersed surface always lies below its centroid | Dec-2011 | 3.5 |
| 8. | Define terms metacenter metacentic height | May-2012 | 4 |
| 9. | Derive equation for total force and centre for a vertical plane surface immersed in | Dec-2012 | 7 |

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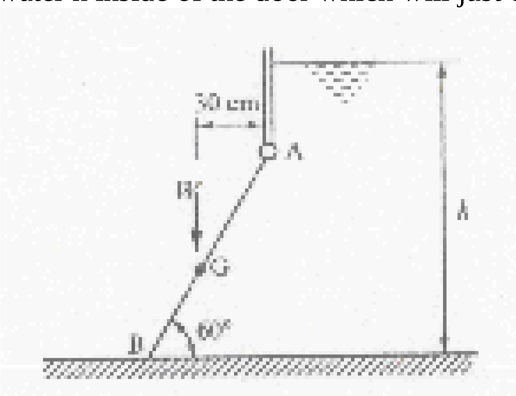
| | a static liquid | | |
| 10. | Define buoyant force, centre of buoyancy, metacentre and metacentric height. Also describe conditions of equilibrium for floating and submerged bodies | Dec-2012 | 7 |
| 11. | Define metacenter and metacentric height. Explain method for determination of metacentric height | May-2013 | 7 |
| 12. | For inclined immersed surface derive with usual notations, expression for total pressure and center of pressure | May-2013 | 7 |
| 13. | Distinguish between centre of pressure and centre of gravity | Dec-2013 | 3 |
| 14. | Explain 'buoyant force'. Discuss different stability conditions for floating body | Dec-2013 | 3 |
| 15. | Derive equation for total pressure and centre of pressure for vertically immersed | May-2014 | 7 |
| 16. | Explain the following terms: 1.buoyancy 2.Metacenter | Dec-2014 | 2 |
| 17. | Explain the condition of stability for a submerged and floating body with near diagram | Dec-2014 | 7 |
| 18. | Derive expressions for total pressure and centre of pressure for vertically immersed surface. | Jun-2015<br>Jun-2016 | 7<br>7 |
| 19. | Explain the conditions of stability for a submerged and floating body with neat diagrams | Jun-2015 | 7 |
| 20. | Explain total pressure and center of pressure | Nov-2016 | 4 |
| 21. | Derive an expression for calculating time period of oscillation of floating body | Nov-2016 | 7 |
| 22. | Write the practical significance of metacentric height | Nov-2016 | 4 |
| 23. | A circular lamina 125 cm in diameter is immersed in water so that the distance of it's edge measured vertically below the free surface varies 60 cm to 150 cm. Find the total force due to water on one side of the lamina, and the vertical distance of the center of pressure below the water surface. | Dec-2009 | 7 |
| 24. | A rectangular sluice door hinged at the top point A and kept closed by a weight fixed on the door. The door is 120 cm wide and 90 cm long. The center of gravity of complete door and weight at G, the combined weight being 9810 N. Find the height of water h inside of the door which will just cause the door to open   | Dec-2009 | 7 |
| 25. | A sluice gate is in the form of circular arc having radius of 5m as shown in Figure. Calculate the magnitude and direction of the resultant force on the gate, the location with respect to O point on it's line of action. | Dec-2009 | 7 |

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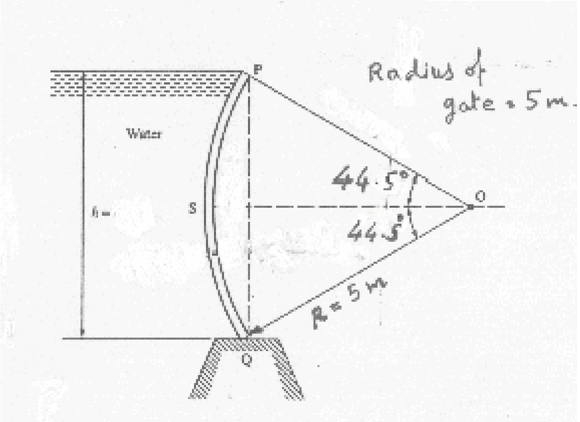
| |  | | |
| 26. | In the laboratory, the floating pontoon 30cm x 45 cm and height of 12 cm, weighing 120 N, is immersed in the water container having dimensions 35 cm x 50 cm. Before immersion the liquid is 10 cm deep. At what level pontoon will float? | Dec-2009 | 3 |
| 27. | A body has the cylindrical upper portion of 4m diameter and 2.4m deep. The lower portion, which is curved, displaces a volume of 800 litres of water and its centre of buoyancy is situated 2.6m below the top of the cylinder. The centre of gravity of the whole body is 1.6m below the top of the cylinder and the total displacement of water is 52 kN. Find the metacentric height of the body | Mar-2010 | 7 |
| 28. | A wooden block of specific gravity of 0.7 and dimensions 18 cm wide, 30 cm deep and 100 cm long floats horizontally on 18 cm wide surface in water. Calculate the metacentric height and comment on the stability of the block. If the block is given a tilt of 6o in the clockwise direction. Calculate what should be the mass should be kept at a distance from the centre 5 cm on the opposite side of offset the tilt. | May-2011 | 7 |
| 29. | A square plate of diagonal 2m is immersed in a liquid with its diagonal vertical and upper corner is 0.5m below the free surface of the liquid. The specific gravity of the liquid is 1.4. Find, (i) The force exerted by liquid on the plate. (ii) The position of its centre of pressure | Dec-2011 | 7 |
| 30. | A solid cylinder 2.5m in diameter and 2.5m high is floating in water with its axis vertical. If the specific gravity of cylinder material is 0.7, Find metacentric height. Also state whether the equilibrium is stable or unstable. | Dec-2011 | 7 |
| 31. | Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Find the position of centre of pressure also. | May-2012 | 7 |
| 32. | A pontoon of 15696 KN displacement is floating in water a weight of 245.25 KN is moved through a distance of 8 m across the deck of pontoon which tilts the pontoon through an angle of 4° find the metacentric height of the pontoon. | May-2012 | 7 |
| 33. | An equilateral triangular plate having 2.5 m side is immersed in water with its base coinciding with the free surface. Calculate total force and center of pressure if, i) the plate is vertical and, ii) angle of inclination of the plate with the free surface is 60o. An equilateral triangular plate having 2.5 m side is immersed in water with its base coinciding with the free surface. Calculate total force and center of pressure if, i) the plate is vertical and, ii) angle of inclination of the plate with the free surface is 60o. | Dec-2012 | 5 |
| 34. | A wooden block of specific gravity 0.75 floats in water. If the size of the block is 1 m X 0.5 m X 0.4 m, find its metacentric height. | May-2013 | 7 |
| 35. | An isosceles triangular plate of base 3 m and altitude 3 m is immersed vertically in an oil of specific gravity 0.8. the base of plate coincides with the free surface of | May-2013 | 7 |

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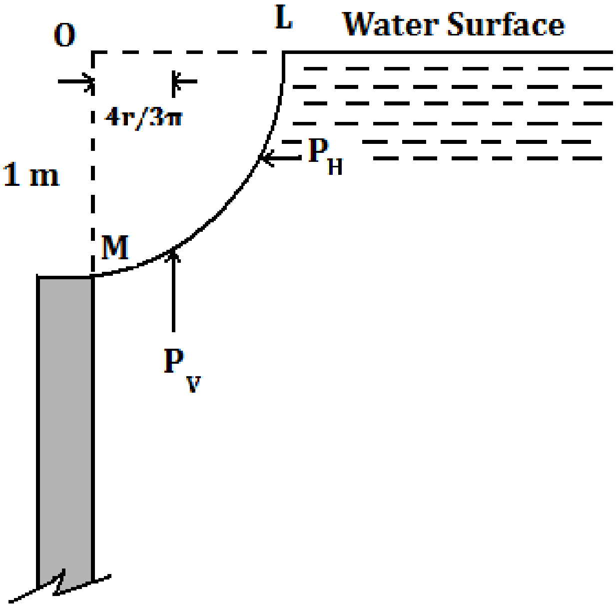
| | oil. Determine total pressure on the plate | | |
| 36. | A solid cube of sides 0.5 m each is made of a material of relative density 0.5. The cube floats in a liquid of relative density 0.95 with two of its faces horizontal. Examine its stability. | Dec-2014 | 7 |
| 37. | Fig. shows a gate having a quadrant shape of radius of 1 m subjected to water pressure. Find the resultant force and its inclination with the horizontal. Take the length of gate as 2 m.   | Dec-2014 | 7 |
| 38. | A cylindrical block weight 22 KN having diameter 2m and height 2.5m is to float in sea water (S=1.025), show that it does not float vertically. | May-2014 | 7 |
| 39. | A solid cylinder 2 m in diameter and 2 m high is floating in water with its axis vertical. If the specific gravity of the material of cylinder is 0.65 find its metacentric height. State whether the equilibrium is stable or unstable. | Jun-2016 | 7 |
| 40. | A rectangular pontoon 8 m long, 6 m wide and 2 m deep, floats in sea water (sp.weight = 10000 N/m3). It carries an empty boiler on its upper dock of 4 m diameter. The weight of pontoon and boiler are 600 kN and 200 kN respectively. The center of gravity of each unit coincides with geometric centre of the arrangement and lie on same vertical line. Find the metacentric height of arrangement and check the stability. | Jun-2015 | 7 |
| 41. | A block of wood has a horizontal cross section 500 mm X 500 mm and height h. it floats vertically in water. If the specific gravity of wood is 0.6, find the maximum height of block so that it can remain in stable equilibrium. | Jan-2016 | 7 |
| 42. | A barge in the shape of a rectangular block 8 m wide, 12.8 m long and 3 m deep floats in water with a draft of 1.8 m. the centre of gravity of the barge is 0.3 m above the water surface. State whether the barge is in stable equilibrium. Calculate the righting moment when the barge heels by 10o | Jan-2016 | 7 |
| 43. | The weight of stone is 530N in air and reduce to 200N while submerging in water find the specific gravity of water | Jun-2015 | 3 |
| 44. | A circular plate 1.5 m diameter is submerged in water, with its greatest and least depths below the surface being 2 m and 0.75 m respectively. Determine:<br>(i) Total pressure on one of the face of the plate<br>(ii) The position of centre of pressure. | Jun-2016 | 7 |

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| | **UNIT 4 Motion of Fluid Particles and Streams** | | |
| 1. | Define : (i) path line (ii)stream line (iii) stream tube | Mar-2010<br>Nov-2016 | 3<br>3 |
| 2. | Explain clearly: stream line; path line and streak line. | Jun-2015 | 7 |
| 3. | Derive an expression for continuity for 3-D flow and reduce it for steady, incompressible 2-D flow in Cartesian coordinate system | Mar-2010 | 7 |
| 4. | Explain Eulerian frame of reference. | Nov-2016 | 4 |
| 5. | Derive an equation for continuity equation for 3D flow and reduce it for steady, incompressible 2D flow. | Nov-2016 | 7 |
| 6. | Derive continuity equation in 3 dimensional co-ordinate system | Dec-2010<br>Jun-2016 | 7<br>7 |
| 7. | Derive the continuity equation in Cartesian co-ordinates. | Jan-2016 | 7 |
| 8. | Explain briefly (i) steady flow and unsteady flow (ii) uniform flow and non uniform flow (iii) laminar and turbulent flow | Dec-2010 | 3 |
| 9. | Explain different types of fluid flows | Nov-2016 | 7 |
| 10. | Distinguish clearly between Rotational and Irrotational flow | Jun-2015 | 3.5 |
| 11. | Define continuously equation and derive an expression for three dimensional flow | Dec-2011 | 3.5 |
| 12. | Define : sub-sonic flow super-sonic flow | Dec-2012 | 4 |
| 13. | Obtain an expression for continuity equation for three dimensional flow | Dec-2012 | 4 |
| 14. | Differentiate between (i) compressible flow and incompressible flow (ii) uniform flow and non-uniform flow | Dec-2012 | 4 |
| 15. | Differential between 1. Steady and unsteady flow 2. Uniform and non-uniform flow 3. Rotational and irrotational flow | May-2013<br>Dec-2014 | 7<br>7 |
| 16. | Define rate of flow. Derive continuity equation | May-2013 | 7 |
| 17. | Explain the terms : rotational flow | Dec-2013 | 2 |
| 18. | Derive an expression for continuity for 3-D flow and reduce it for steady incompressible 2-D flow in Cartesian coordinate system | May-2014 | 7 |
| 19. | Velocity components of a fluid flow are given as $u = (6xy^2 + t)$, $v = (3yz + t^2 + 5)$, $w = (z + 3\,ty)$, where x, y, z are given in meters and time t in seconds. Determine velocity vector at point P (4, 1, 2) at time t = 4 seconds. Also determine the magnitude of velocity and acceleration of the flow for given location and time. | Dec-2010 | 7 |
| 20. | Velocity for a two dimensional flow field is given by $V=(3+2xy+4t^2)i+(xy^2+3t)j$ Find the velocity and acceleration at appoint (1,2) after 2 sec. | Jan-2016 | 5 |
| | **UNIT 5 The Energy Equation and its Application** | | |
| 1. | Write a short note on kinetic energy correction factor | Mar-2010 | 3 |
| 2. | Derive an expression for the measurement of velocity of flow at any point in pipe or channel by pitot tube | Mar-2010 | 4 |
| 3. | Derive expression for bernoulli’s theorem for stream line flow. Also write assumption for the same | Dec-2010<br>May-2013<br>Nov-2016<br>Jan-2016 | 7<br>7<br>7<br>7 |

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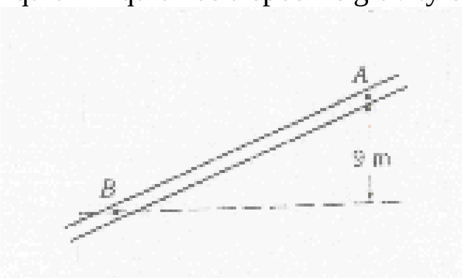
| 4. | With usual notations derive the expression for the discharge through a triangular notch | Dec-2010 | 7 |
| 5. | Derive euler's equation of motion along a streamline and hence obtain bernoulli's equation clearly state assumption made | May-2011 | 7 |
| 6. | Derive euler's equation for motion along stream line for an ideal fluid and integrate it to get bernoulli's equation | Dec-2011<br>Jun-2016<br>Jan-2016 | 7<br>4<br>7 |
| 7. | Explain the construction and working of a venturimeter and also derive an expression for the discharge through it | Dec-2011 | 7 |
| 8. | Compare triangular notch with rectangular notch for measuring discharges and derive an expression for the discharge through a triangular notch | Dec-2011 | 7 |
| 9. | State Bernoulli's theorem | May-2012<br>Dec-2013 | 3<br>3 |
| 10. | Derive an expression for the discharge through a venturimeter | May-2012<br>May-2014 | 4<br>7 |
| 11. | Obtain Bernoulli's equation for compressible flow considering adiabatic process. | Jun-2016 | 4 |
| 12. | What are the advantages of triangular notch over rectangular notch ? | May-2012 | 3 |
| 13. | Find an expression for the discharge over a rectangular notch | May-2012<br>Jun-2016<br>Jun-2015 | 4<br>4<br>7 |
| 14. | Derive the expression for time required to emptying a tank through an orifice at its bottom | Jan-2016 | 7 |
| 15. | Define kinetic energy correction factor and momentum correction factor | May-2012 | 3 |
| 16. | Explain vena- contracta. Discuss the characteristics of flow at vena-contracta in case of orifice | Dec-2013 | 7 |
| 17. | State and explain momentum principle. What are its application | Dec-2013 | 7 |
| 18. | A horizontal venturimeter with inlet diameter 150 mm and throat diameter 75 mm is used to measure discharge. The differential manometer gives reading of 150 mm of mercury. Determine the rate of flow if $C_d$ is 0.98 | Jun-2016 | 3 |
| 19. | A 300 mm X 150 mm venturimeter is placed vertically with throat 250 mm above the inlet section conveys kerosene of density 820 kg/m$^3$. The flow rate is 140 litre/sec. calculate the pressure difference between inlet and throat section. Take $C_d$ = 0.97. | Jun-2015 | 7 |
| 20. | A crude oil of viscosity 0.9 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 120 mm and length 12 m. calculate the difference of pressure at the two ends of the pipe, if 785 N of the oil is collected in tank in 25 seconds | Jan-2016 | 7 |
| 21. | The pipe AB is of uniform diameter ( Figure ) and the pressure at A and B are 150 and 250 kN/m$^2$ respectively. Find the direction of the flow and head loss in meters of liquid if liquid has a specific gravity of 0.85   | Dec-2009 | 4 |

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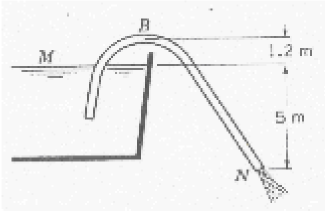
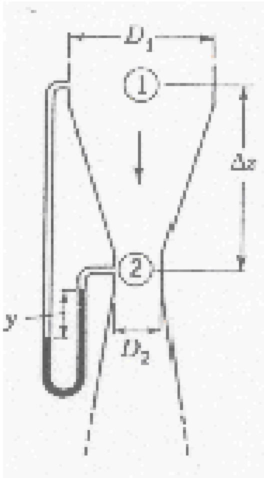
| 22. | Referring to the Figure,assume that the flow to be friction less in the siphon. Find the discharge in $m^3/s$ and the pressure head at the point B if the pipe is of uniform diameter of 15 cm .   | Dec-2009 | 7 |
| 23. | A flat plate is struck normally by a jet of water 50 mm diameter with a velocity of 18 m/s. Calculate ( i ) the force on the plate when it is stationary, ( ii ) the force on the plate when it moves in the same direction as the jet with a velocity of 6 m/s and ( iii ) the work done per second in case ( ii ). | Dec-2009 | 7 |
| 24. | Describe the procedure of measurement of velocity with the Pitot tube. Find flow rate of water for venturimeter if mercury manometer reads y = 10 cm for the case where $D_1$ = 20 cm and $D_2$ = 10 cm and $\Delta z$ = 0.45 m ( Refer Figure)   | Dec-2009 | 7 |
| 25. | A sharp edged orifice , 5 cm in diameter, in the vertical side of large tank discharges water under a head of 5 m. If $C_c$ = 0.62 and $C_v$ = 0.98 , determine ( a ) the diameter of jet at the venacontracta, (b) the velocity at the venacontracta and (c) discharge in $m^3/s$. | Dec-2009 | 4 |
| 26. | In an experiment on $90^0$ Vee notch, the flow is collected in a 0.90 m diameter vertical cylindrical tank. It is found that the depth of water increases by 0.685 m in 16.8 seconds when the head over the notch is 0.2 m. Determine the coefficient of discharge. If the error in observation of head over the notch is 1mm, what will be the error in discharge? | Dec-2009 | 7 |
| 27. | The water is flowing through a taper pipe of length 100 m having diameter 600 mm at the upper end and 300 mm at the lower end, at the rate of 50 litres/sec. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19.62 * $10^4$ N /$m^2$ & lower end is 10 m above datum | Mar-2010 | 7 |
| 28. | A horizontal Venturimeter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of oil of sp.gr 0.8. The discharge of oil through venturimeter is 60 Liters/Second. Find the reading of the oil mercury differential manometer take Cd = 0.98. | May-2011 | 7 |
| 29. | The head of water over an orifice of diameter 7.5 cm is 7.5 m. The jet of water coming out from the orifice is collected in a tank having cross-sectional area of 1 m x 1 m. The rise of water level in this tank is 0.87 m in 25 seconds. The coordinates of a point on the jet measured from venacontracta are 3.75 m horizontal and 0.5 m vertical. Find theco-efficient of discharge, co-efficient of velocity and coefficient of contraction. | Dec-2012 | 6 |
| 30. | A horizontal venturimeter with inlet and throat diameters 0.3 m and 0.15 m respectively is used to measure the flow of water in a pipe. The reading of differential manometer connected to the inlet and the throat is 0.25 m of mercury. Determine the rate of flow, if | Dec-2012 | 4 |

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| | the coefficient of discharge is 0.97. | | |
| 31. | A horizontal venturimeter of 200 mm X 100 mm is used to measure the discharge of an oil of specific gravity 0.85. A mercury manometer is used for the purpose. If the discharged is 100 litres per second and if the coefficient of discharge of the venturimeter is 0.97, find the difference of mercury level in between two limbs of manometer. | Dec-2010 | 7 |
| 32. | The inlet and throat diameters of a vertically mounted venturimeter are 30 cm and 10 cm respectively. The throat section is below the inlet section at a discharge of 10 cm. The specific gravity of the liquid is 900 $Kg/m_3$. The intensity of pressure at inlet is 140 KPa and the throat pressure is 80 KPa. Calculate the flow rate in Lps.. Assume that 2 % of the differential head is lost between inlet and throat. Take coefficient of discharge 0.97. | May-2011 | 7 |
| 33. | The water is flowing through a tapering pipe having diameters 300 mm and 150 mm at section 1 and section 2 respectively. The discharge through the pipes is 40 liters / sec. The section 1 is 10 m above datum and section 2 is 6 m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 $kN/m_2$ | May-2013 | 7 |
| 34. | A pipe line carrying oil of specific gravity 0.9, changes in diameter from 250mm diameter at a position 1 to 450 mm diameter at a position 2 which is 6 meter at a higher level. If the pressure at 1 and 2 are 12 N/cm2 and 6 N/cm2 respectively and the discharge is 250 litre/sec. calculate the loss of head and direction of flow. | May-2014 | 7 |
| 35. | Find the discharge of water flowing through a pipe 30 cm diameter placed in an inclined position where a venture meter is inserted, having a throat diameter of 15 cm. The difference of pressure between the main and throat is measured by a liquid of specific gravity 0.6 in an inverted U-tube which gives a reading of 30 cm. The loss of head between the main and throat is 0.2 times the kinetic head of the pipe. | Dec-2014 | 7 |
| 36. | Explain momentum correction factor required for the flow past a section. A liquid flows through the circular pipe 0.6 m diameter. Measurements of velocity taken at interval along a diameter as under.<br>DistanceFrom wall,m 0 0.05 0.1 0.2 0.3 0.4 0.5 0.55 0.6<br>Velocity,m/s 0 2.00 3.8 4.6 5.0 4.5 3.7 1.6 0<br>The total momentum per unit time is 2394.00 kg. Find the true momentum in context of average velocity and find the momentum correction factor. | Dec-2009 | 7 |
| | **UNIT 6 Two-Dimensional Ideal Fluid Flow** | | |
| 1. | Derive an expression of stream function and velocity potential function for vortex flow | Mar-2010 | 4 |
| 2. | Define and explain circulation. What is the importance of concept of circulation? | Mar-2010 | 3 |
| 3. | Explain flow net and state the importance of flow net | Mar-2010 | 4 |
| 4. | Explain the following in brief: (i) stream function (ii) velocity potential function (iii) circulation (iv) flow net | Dec-2010 | 4 |
| 5. | Explain the term Vorticity. | Jun-2016 | 3 |
| 6. | Define circulation. Prove that circulation $\Gamma = \int \xi \, dA$ with usual notation | May-2011 | 7 |
| 7. | Derive an expression for continuity for three dimensional flow and reduce it for steady incompressible two dimensional flow | May-2011 | 7 |
| 8. | Define stream function and velocity potential function | Dec-2011 | 3.5 |
| 9. | Define vortex flow. Derive an expression of stream function and velocity potential function for vortex flow. | Nov-2016 | 7 |

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| 10. | Distinguish between forced vortex and free vortex flow | Dec-2011 | 3.5 |
| 11. | What do you mean by equipotential line and a line of constant stream function | May-2012 | 4 |
| 12. | Differentiate between streamline and equipotential line | Dec-2013 | 3 |
| 13. | Define circulation and velocity potential function. Explain flow net and state the important of flow net | May-2014 | 3 |
| 14. | Determine whether the following flows are rotational or ir-rotational<br>( 1 ) u = -2y v = 3x<br>( 2 ) u = 0 v = 3xy<br>( 3 ) u = 2x v = -2y | Dec-2009 | 3 |
| 15. | The stream function for a two dimensional flow is given by $\psi$ = 3xy. Calculate the velocity at point P (2, 4). Also find the velocity potential function, $\Phi$ | Dec-2012 | 4 |
| 16. | The stream function of a two dimensional flow is given by $\psi$ = 2xy + 25. Calculate the velocity at the point (1, 2). Also find the velocity potential function Ø. | Jun-2016 | 7 |
| 17. | For 2-D flow field, the velocity potential is given as $\Phi$=2xy-x. determine the stream function $\psi$ at a point P(2,2) | Dec-2013 | 4 |
| 18. | The velocity component in a two-dimensional flow field for an incompressible fluid are as follows: u = y3/3 + 2x - x2y and v = xy2 – 2y – x3/3 Obtain an expression for the stream function $\psi$. | Dec-2014 | 7 |
| 19. | A stream function in 2-D flow is $\psi$=2xy. Calculate the velocity at point (3,2). Find the corresponding velocity potential $\Phi$ | Jan-2015 | 4 |
| 20. | A vessel, cylindrical in shape and closed at the top and bottom, contains water up to a height of 80 cm. The diameter of the vessel is 20 cm and length of vessel 120 cm. The vessel is rotated at a speed of 400 r.p.m. about its vertical axis. Find the height of parabola formed. | Dec-2014 | 7 |
| 21. | An open circular cylinder of 15 cm diameter and 100 cm long contains water up to a height of 80 cm. Find the maximum speed at which the cylinder is to be rotated about its vertical axis so that no water spills. | May-2012 | 7 |
| 22. | | | |
| | **UNIT 7 Dimensional Analysis And Similarities** | | |
| 1. | Using the method of dimensional analysis obtain an expression for the discharge Q over a rectangular weir. The discharge depends on the head H over the weir, acceleration due to gravity g, length of the weir crest over the channel bottom Z and the kinematic viscosity v of the liquid | Jan-2016 | 7 |
| 2. | Explain the procedure for selection of repeated variables in dimensional analysis | Jun-2016 | 3 |
| 3. | The resistance R to the motion of completely submerged body depends on length of body, velocity of flow, mass density and kinematic viscosity. Find the relation between R and other variables using suitable method. | Jun-2016 | 7 |
| 4. | Define dimensional analysis with an example | Nov-2016 | 3 |
| 5. | Explain different types of hydraulic models. | Nov-2016 | 4 |
| 6. | Discuss different types of similarities that must exist between a prototype and its model. | Jan-2013 | 4 |
| 7. | Explain significance of any two dimensionless numbers in the model analysis. | Jan-2013 | 4 |
| 8. | The pressure difference $\Delta p$ in a pipe of diameter d and length L due to viscous | Jan-2013 | 6 |

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| | flow, depends on velocity v, viscosity μ and density ρ. Using Buckingham's π-theorem, obtain an expression for Δp. | | |
| 9. | What is meant by geometric, kinematic, and dynamic similarities? | May-2012 | 3 |
| 10. | State Buckingham's ∏ theorem method. What do you mean by repeating variables | May-2012 | 4 |
| 11. | Using Buckingham's π-theorem, show that the lift FL on airfoil can be expressed as $F_L = \rho V^2 d^2 \Phi[(\rho Vd/\mu),\alpha]$.Where, ρ= mass density V= velocity of flow, d=characteristic depth μ =co-efficient of viscosity and α=angle of incidence | Mar-2010 | 7 |
| 12. | State Model (similarity) laws. Where they are used ? Explain Euler's model law | Mar-2010 | 4 |
| 13. | State Buckingham's π-theorem. How the repeating variables are selected in dimensional analysis? | Mar-2010 | 3 |
| 14. | Define the following dimensionless numbers:(I) Reynold's No. (II) Froude No. (III) Euler's No. (IV) Mach No. | Dec-2010 | 4 |
| 15. | The pressure difference Δp in a pipe of diameter D and length L due to turbulent flow depends on velocity V, viscosity μ, density ρ and roughness k. Using Buckingham's π-theorem obtain an expression for Δp. | Dec-2010 | 7 |
| 16. | The efficiency η of a fan depends on the density ρ, the dynamic viscosity μ of the fluid, the angular velocity ω, diameter D and discharge Q. Express efficiency η in terms of dimensionless parameters by using Buckinghams-π thorem. | Dec-2011 | 7 |
| 17. | State the various dimensionless numbers with their significance in fluid flow situations | Dec-2011 | 3.5 |
| 18. | Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by propeller. Assume that thrust P depends upon the angular velocity ω, speed of advance V, diameter D, dynamic viscosity μ, mass density ρ, elasticity of the fluid medium which can be denoted by speed of the sound in the medium C. | May-2011 | 7 |
| 19. | State similarity laws. Where are they used? Explain Froude, Euler and Weber model law with applications. | May-2011 | 7 |
| 20. | The efficiency of fan depend upon diameter of rotor, discharge of fluid, density of fluid, dynamic viscosity of fluid and angular velocity of rotor. Find the expression for efficiency in terms of dimensionless number. | May-2014 | 7 |
| 21. | Explain euler's, weber and mach model law. | May-2014 | 7 |
| 22. | Explain Buckingham's Π – theorem for dimensional analysis. | May-2013 | 7 |
| 23. | 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. | May-2013 | 7 |
| 24. | Prove that the scale ratio for discharge for a distorted model is given as $Qp / Qm = (Lr)_H (Lr)_V^{1.5}$ | Dec-2014 | 7 |
| 25. | The resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft l, velocity V, viscosity of air μ, air density ρ and bulk modulus of air K. Express the functional relationship between these variables with the resisting force | Dec-2014 | 7 |
| 26. | A pipe of 1.4m in diameter is required to transport an oil of specific gravity 0.8 and dynamic viscosity 0.04 poise at the rate of 2500 litres per second.Test were conducted on a150mm diameter pipe using water at 20˚C. The viscosity of water at 20˚C is 0.01 poise.Find the rate of flow in the model | Dec-2011 | 7 |

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| 27. | A ship 250 m long moves in sea-water, whose density is 1025 kg/m3. A 1:100 model of this ship is to be tested in a wind tunnel. The velocity of air in the wind tunnel around the model is 25 m/s and the resistance of the model is 50 N. Determine the velocity of ship in sea-water and also resistance of the ship in sea-water. The density of air is 1.24 kg/m2, the kinematic viscosity of sea-water is 0.012<br>stokes and viscosity of air is 0.018 stokes. | Jan-2013 | 7 |
| 28. | The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by,<br>$T = D^5 N^2 \rho \varphi \left[\frac{\mu}{D^2 N \rho}\right]$<br>Prove this by Buckingham's π method. | June-2015 | 9 |
| 29. | What are repeating variables? How are they selected for dimensional analysis? | June-2015 | 5 |
| | **UNIT 8 Viscous flow** | | |
| 1. | Derive an expression for velocity distribution for viscous flow through a circular pipe also sketch the velocity distribution and shear stress distribution across of a pipe | Mar-2010 | 3 |
| 2. | State characteristics of laminar flow | Mar-2010 | 2 |
| 3. | Write a short note on say bolt viscometer | Mar-2010 | 4 |
| 4. | Derive the expression for shear stress distribution for the flow of viscous fluid through circular pipe with usual notations | Dec-2010 | 7 |
| 5. | Two parallel plates 80 mm apart have laminar flow of oil between them with maximum velocity of flow is 1.5 m/s. Calculate : (I) Discharge per meter width (II) Shear stress at the plate (III) The difference in the pressure between two points 20 meter apart. (IV) Velocity gradient at the plates. (V) Velocity at 20 mm from the plate. Assume viscosity of oil 24.5 poise. | Dec-2010 | 7 |
| 6. | What is Hagen Poiseuille's formula? Derive an expression for Hagen Poiseuille's formula. | May-2011<br>May-2012<br>Dec-2014<br>Jun-2015<br>Jun-2016<br>Nov-2016 | 7<br>7<br>7<br>7<br>7<br>7 |
| 7. | Two parallel plates kept 100 mm apart have laminar flow of oil<br>between them. Maximum velocity of flow is 1.5 m/sec. Calculate<br>1). Discharge per meter width<br>2). Shears stress at the plate<br>3). Difference in pressure between two point 20 meter apart<br>4). Velocity gradient of plates<br>5). Velocity at 20 mm from the plates | May-2011 | 7 |
| 8. | A laminar flow is taking place in a pipe of diameter of 200 mm. The maximum velocity is 1.5 m/sec. Find the mean velocity and the radius at which this occurs. Also calculate the velocity at 4 cm from the wall of the pipe | May-2011 | 7 |
| 9. | A disc of 100 mm diameter rotates on a table separated by an oil film of 2 mm thickness. Find the torque required to rotate the disc at 60 rpm, if the dynamic viscosity of oil is 0.05 poise. Assume the velocity gradient in oil film to be linear | Dec-2011 | 7 |

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| 10. | State the characteristics of a viscous flow. | Dec-2011 | 3 |
| 11. | Derive an expression of the velocity distribution for the viscous through a circular pipe. Also sketch the distribution of velocity and shear stress across the section of a pipe. | Dec-2011 | 4 |
| 12. | Derive an expression for power absorbed in overcoming viscous resistance in case of a journal bearing | Dec-2011 | 7 |
| 13. | Show that the value of the co-efficient of friction for viscous flow through a circular pipe is given by f =- 16/Re where Re = Reynolds number. | May-2012 | 4 |
| 14. | Explain Dash pot mechanism and its utility. | May-2012 | 7 |
| 15. | 20 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 20.1 cm. The space between the cylinders is filled with an oil whose viscosity is to be determined. If a torque of 30 N-m is required to rotate inner cylinder at 100 r.p.m., find the viscosity of the oil. Take height of both the cylinders as 0.3 m. | Jan-2013 | 7 |
| 16. | Derive and sketch the velocity distribution for viscous flow through a circular pipe. Using that prove that the ratio of maximum velocity to the average velocity is 2. | Jan-2013 | 7 |
| 17. | Obtain relationship between shear stress and pressure gradient for laminar flow | May-2013 | 7 |
| 18. | A 50 mm diameter shaft rotates with 500 rpm in a 80 mm long journal bearing with 51 mm internal diameter. The annular space between the shaft and bearing is filled with lubricating oil of dynamic viscosity 1 poise. Determine the torque required and power absorbed to overcome friction | May-2014 | 7 |
| 19. | An oil of viscosity 4 poise is used for lubrication between a shaft and sleeve. The diameter of the shaft is 0.5 m and it rotates at 250 rpm. Calculate the power lost in oil for a sleeve length of 100 mm. The thickness of oil film is 1 mm. | Dec-2014 | 7 |
| 20. | A crude oil of viscosity 0.9 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 120 mm and length 12 m. calculate the difference of pressure at the two ends of the pipe, if 785 N of the oil is collected in tank in 25 seconds. | Jan-2016 | 7 |
| 21. | Calculate the shear stress developed in oil of viscosity 1.2 poise, used for lubricating the clearance between a shaft of diameter 12 cm and its journal bearing. The shaft rotates at 180 rpm and clearance is 1.4 mm. | Jun-2015 | 7 |
| 22. | **UNIT 9 Turbulent Flow** | | |
| 23. | Derive an expression for loss of head due to friction in pipe flow. | Jan-2016<br>Jun-2015 | 7<br>7 |
| 24. | Obtain Darcy-Weisbach formula for head loss due to friction | Jun-2016 | 4 |
| 25. | An oil of specific gravity 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 liters/s. Find the head lost due to friction for a 500 mm length of pipe. Also find the power required to maintain the flow. Take f = $0.079/(R_e)_{1/4}$ | Jun-2016 | 7 |
| 26. | What is velocity defect? Derive an expression for the velocity defect for turbulent flow in pipes | Dec-2011 | 7 |
| 27. | Derive an expression for shear stress on basis of prandtl mixing length theory | Dec-2011 | 4 |
| 28. | Write a short note on moody diagram for calculating the head loss due to friction | May-2014 | 7 |
| 29. | Derive Darcy-Weisbach equation for head loss due to friction in pipe flow. | Dec-2016 | 7 |

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| | | Mar-2010<br>Dec-2010<br>May-2011<br>Dec-2012<br>May-2013<br>Dec-2014 | 7<br>7<br>7<br>7<br>7<br>7 |
| | **UNIT 10 Flow Through Pipe** | | |
| 1. | Explain (1) Hydraulic Grade Line (2) Total Energy Line | Dec-2009 | 2 |
| 2. | Derive an equation for loss of head loss to sudden enlargement | Nov-2016 | 4 |
| 3. | Derive an expression for the loss of head due to friction in pipes. | Jan-2015 | 5 |
| 4. | What do you understand by the terms major energy loss and minor energy losses in pipe? | Dec-2010 | 3.5 |
| 5. | Distinguish clearly between total Energy line (TEL) and hydraulic Grade line (HGL) | Dec-2013 | 3.5 |
| 6. | Calculate the loss of head and power required to maintain the flow in a horizontal circular pipe of 40 mm diameter and 750m long when water flow at a rate of 30 liters / minute. Take Darcy's friction factor as 0. 032. | Dec-2009 | 3 |
| 7. | A 50m long pipe of 10 cm diameter carries water at a velocity 5 m/s. It has been decided to replace 25 m of above pipe by enlarged diameter pipe of 20 cm , the change of section being sudden. Assuming f = 0.02 and coefficient of contraction $C_c$ = 0.62 , find saving in the head loss due to replacement of pipe. | Dec-2009 | 7 |
| 8. | A water tank 4 km away from a college hostel. Water supplies 150 lit per day per student. The strength of student in hostel is 1000. The total water required is pumped into the tank in night time for 6 hours. Calculate diameter of pipe when head loss is limited to 25m. assume f=0.0018 | May-2014 | 7 |
| 9. | A pipe AB branches into two pipes BC and BD. The pipe has diameter of 30 cm at A, 20 cm at B, 15 cm at C and 10 cm at D. Determine the discharge at A if flow velocity at A is 2.5 m/s. Also find the velocity at B and D, if the velocity at C is 4.2 m/s. | Jan-2015 | 7 |
| | **UNIT 11 Compressible fluid flow** | | |
| 1. | With the help of diagram, explain relationship between mass flow rate and pressure ratio for compressible flow | Mar-2010 | 3 |
| 2. | Prove that the velocity at outlet of nozzle for maximum flow rate equal to sonic velocity | Mar-2010 | 4 |
| 3. | Prove that velocity of sound wave in compressible fluid is given by $C=\sqrt{\frac{k}{\rho}}$ where k=bulk modulus of fluid and ρ= density of fluid | Dec-2010<br>May-2011<br>May-2012<br>Dec-2012<br>Jun-2015 | 7<br>7<br>4<br>7<br>7 |
| 4. | Drive an expression for velocity of sound wave in a compressible fluid in terms of change of pressure and change of density | Dec-2011<br>Jun-2016 | 7<br>3 |
| 5. | State bernolli's theorem for compressible fluid flow and derive an expression for the same when the process is adiabatic | Dec-2011 | 7 |
| 6. | Explain propagation of sound waves for Sub sonic and Sonic flow. | Jun-2016 | 4 |
| 7. | Define compressible and incompressible. | Nov-2016 | 4 |
| 8. | Define mach number and mach cone | May-2012 | 3 |

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| 9. | Define sub-sonic flow, super-sonic flow, mach angle and mach cone | Dec-2012 | 4 |
| 10. | Explain mach cone, zone of silence, stagnation pressure, adiabatic process. Derive the energy equation for compressible flow in an adiabatic process | Dec-2013 | 7 |
| 11. | Explain the propagation of pressure waves with neat sketch | Dec-2014 | 7 |
| 12. | At what speed the shock wave propels in the flow in the air at 1750 kN/m2 ,absolute, is moving at 150 m/s in the high pressure wind tunnel at 40 C0.Take R=287. State whether the flow super-sonic or not. | Dec-2009 | 4 |
| 13. | Certain mass of air is passing through a horizontal pipe with a velocity of 350 m/s, at a section with corresponding pressure of 80 KN/m2 absolute and temperature 45ºC. There is a change in diameter of the pipe at a section and pressure at this section is 128 KN/m2, absolute. Find the velocity of air stream if the flow is adiabatic. | Dec-2010 | 7 |
| 14. | Air has velocity of 1000 Km/hr at pressure of 9.81 KN/m2 vacuum and temperature of 47oC. Compute its stagnation properties and the local Mach number. Take atmospheric pressure = 98.1 KN/m2 , R= 287 J/KgK and $\gamma$ = 1.4 | May-2011 | 7 |
| 15. | Calculate the pressure exerted by 5 kg of nitrogen gas at a temperature of 10ºc if the volume is 0.4cubic meter. Molecular weight of nitrogen is 28.Assume ideal gas laws are applicable. take universal gas constant (MR) = 8314 Nm/kg-mole-K | May-2012 | 7 |
| 16. | Calculate the stagnation pressure temp. and density on the stagnation point on the nose of the plane which is flying at 800 km/hr through still air having a pressure 8 N/square cm (abs) and temp. – 10 º c. Take R = 287 J/Kg –K, $\gamma$ = 1.4 | May-2012 | 7 |
| 17. | Calculate the stagnation pressure and temperature on the stagnation point on the nose of a plane, which is flying at 900 km/hr through still air having an absolute pressure 9.0 N/cm2 and temperature -10o C. Take R = 287 J/Kg K and k = 1.4. | Dec-2013 | 7 |
| 18. | A projectile is travelling in air having pressure and temperature as 0.1 N/mm2 and 00c. the mach angle is 380. Calculate the velocity of the projectile. Assume R=0.287 Kj/kg k. | May-2014 | 7 |
| 19. | A supersonic aircraft flies at an altitude of 1.8 km where temperature is 4o C. determine the speed of the aircraft if its sound is heard 4 seconds after its passage over the head of an observer. Take R = 287 J/kg K and  = 1.4. | Jan-2016 | 7 |
| 20. | A projectile is travelling in air having pressure 8.83 N/Cm2 and temperature -20C. If the mach angle is 400, find the velocity of projectile. Take k = 1.4 and R = 287 J/kgK | Jun-2016 | 3 |