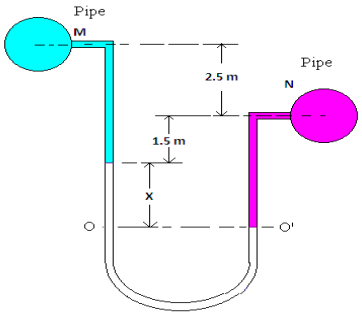
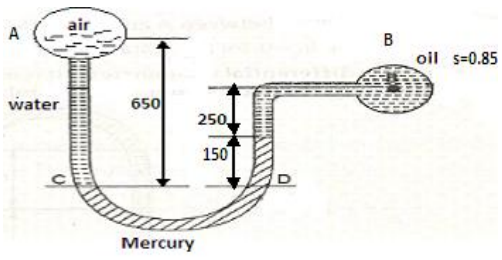
QUESTION BANK

UNIT-I

S. No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
1	a) Define viscosity and derive Newton's law of viscosity. b) If the velocity distribution over a plate is given by u = (2/3)y – y^2, in which 'u' is the velocity in m/s at a distance 'y' meter above the plate, determine the shear stress at y=0 and y=0.15m. Take dynamic viscosity of fluid as 8.63 poise.	Knowledge, Application	1, 3
2	a) Differentiate between U-tube and Inverted U-Tube differential manometers. b) As shown in fig, pipe M contains carbon tetrachloride of specific gravity 1.594 under a pressure of 1.05 Kgf/cm^2 and pipe N contains oil of specific gravity 0.8. If the pressure in the pipe N is 1.75 Kgf/cm^2 and the manometric fluid is mercury. Determine the difference 'X' between the levels of mercury. 	Comprehension, Application	1, 3
3	a) Explain the terms surface tension and vapor pressure. b) A 40 mm diameter shaft is rotating at 200 rpm in a bearing of length 120 mm. if the thickness of oil film is 1.5mm and dynamic viscosity of oil is 0.7Ns/m^2. Determine i) torque required to overcome friction in bearing, ii) power utilized in overcoming viscous resistance.	Comprehension, Application	1, 3
4	a) State Newton's law viscosity and explain how viscosity varies with temperature for liquids and gases. b) Figure shows a differential manometer connected at two points A & B at A air pressure is 100 KN/m^2. Determine the absolute pressure at B 	Knowledge, Application	1, 3

5	a) An oil film of thickness 1.5mm is used for lubrication between a square plate of size 0.9m x 0.9m and an inclined plane having an angle of inclination 20^0. The weight of the square is 392.4 N and it slides down the plane with a uniform velocity of 0.2 m/s. Determine the dynamic viscosity of the oil. b) Define atmospheric, gauge and vacuum pressures with examples.	Application, Knowledge	1, 3
6	a) An inverted u-tube manometer is connected to two horizontal pipes A & B through which water is flowing. The vertical distance between the axes of these points is 30 cm. When an oil of sp. 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 center lines of the pipes) are found to be same and equal to 35 cm. Determine the difference of pressure between the pipes. b) Derive an expression for surface tension on a liquid droplet.	Application, Synthesis	1, 3
7	a) Derive an expression for surface tension on a liquid jet. b) The surface tension of water in contact with air 20^0c is given as 0.0716N/m .The pressure inside the drop let of water is to be 0.0417N/cm^2 greater than the outside pressure. Calculate the diameter of the droplet of water.	Synthesis, Application	1, 3
8	a) The velocity profile of a viscous fluid over a plate is parabolic with vertex 20cm from the plate, where the velocity is 120cm/s. calculate the velocity gradient and shear stress at distance of 0.5 and 15cm from the plate, given the viscosity of the fluid =6 poise. b) Define specific gravity, specific volume and weight.	Application, Knowledge	1, 3
9	a) An oil film of thickness 1.5mm is used for lubrication between a square plates is of size 0.9m x 0.9m and an inclined plane having an angle of inclination 20^0. The weight of the square is 392.4N and it slides down the plane with a uniform velocity of 0.2 m/s. Calculate the dynamic viscosity of the oil. b) How do you measure the pressure by using manometers and mechanical gauges?	Application	1, 3
10	a) Why does the viscosity of a gas increases with the increases in temperature while that of a liquid decreases with increase in temperature? b) Calculate density, specific weight and weight of 1 litre of petrol of specific gravity 0.7	Comprehension, Application	1, 3

UNIT-II

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
1	a) Define path line, stream line steam tube and streak line. b) Water flows through a pipe AB 1.2 m dia. at 3m/s and then pass through pipe BC 1.5 m dia. At C the pipe branches, branch CD is 0.8 m dia. And carries $1/^3$ rd of the flow in AB the flow velocity in branch CE is 2.5 m/s. Calculate the volume rate of flow in AB, the velocity in BC, the velocity in CD and dia. of CE.	Application, Knowledge	2
2	a) Define and state the applications of momentum equation. b) A 45^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40cm and 20cm respectively. Find the force exerted by water on the bend, if the intensity of the pressure at inlet of bend is 21.58N/cm^2. The rate of flow of water is 500 liters per second.	Application, Knowledge	2
3	a) State the assumptions and derive Bernoulli's equation for flow along a stream line. b) Define and state examples of following flows i) Steady and unsteady ii) Laminar and turbulent	Knowledge	2
4	a) Explain body force, surface force and line force with examples b) How impulse momentum equation can be applied for the force exerted by fluid on the bend pipe.	Comprehension, Application	2
5	a) The velocity vector in a flow field is given as V = $4x^3i$ - 10 x^2yj + 2tk. Determine the velocity and acceleration of a fluid particle at (2, 1, 3) at time=1. b) Derive continuity equation in one dimensional flow.	Application , Synthesis	2
6	a) Derive continuity an expression for continuity equation in three dimensional flow. b) The water is flowing through a pipe having diameters 20cm and 15cm at sections 1 and 2 respectively. The rate of flow through pipe is 40 ltr/s. the section 1 is 6 m above datum line and section 2 is 3m above the datum. If the pressure at section 1 is 29.43 N/cm^2, Calculate the intensity of pressure at section 2.	Synthesis, Application	2
7	a) 250 lps of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 135^0 find the magnitude and the direction of the resultant force on the bend. The pressure of water flowing is 39.24 N/cm^2. b) Define rotational and irrotational flows with examples.	Application, Knowledge	2
8	a) a pipe of diameter 400 mm carries water at a velocity of 25 m/s. the pressure at the points A & B are given as 29.43 N/cm^2 and 22.563 N/cm^2 respectively, while the datum head at A and B are 28 m and 30 m. Calculate the loss of head at A and B. b) Define uniform and non-uniform flows with examples.	Application, Knowledge	2

9	a) The water is flowing through a taper pipe of length 100 m having diameters 600 mm at the upper end and 300 mm at the lower end, at the rate of 50 lps. The pipe has a slope of 1 in 30; determine the pressure at lower end if pressure at higher level is 19.62 N/cm^2. b) Derive an expression for Euler's equation of a flow along a stream line.	Application , Synthesis	2
10	a) A 300 mm diameter pipe carries water under a head of 20 m with a velocity of 3.5 m/s. If the axis of the pipe turns through 45^0, calculate the magnitude and the direction of the resultant force at the bend. b) Define compressible and in-compressible flows with examples.	Application , Knowledge	2

UNIT-III

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
1	a) Briefly explain (i)Intake structure (ii)penstock (iii) Anchor Block. b) Draw a neat sketch of a Hydropower plant and show the various elements and providing it.	Synthesis, Knowledge	6, 2
2	a) Explain what is a pumped storage with a neat diagram .what are the features and uses of it b) Draw a mass curve and explain the use of it in detail	Application , Knowledge	6, 2
3	a) Distinguish clearly between the following types of Hydro power plants. i)Base load and peak ii)Run of River and pumped storage plants.	Knowledge, Application	6, 2
4	a) Define energy thickness, momentum thickness and boundary layer thickness. b) Derive an expression for momentum thickness of boundary layer.	Synthesis, Knowledge	6, 2
5	The annual peak load on a 30 MW power station is 25 MW. The power station supplies load having maximum demands of 10MW,8.5MW,5.0MW and 4.5MW.The annual load factor is 45% Find (i) Average load (ii) Energy supplied per year (iii) Demand factor of the Power station	Synthesis, Application	2

UNIT-IV

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
1	a) Differentiate the impulse and reaction turbines. b) A jet of water 50 mm in diameter issues with a velocity of 10m/sec and impinges normally on a stationary flat plate which moves in forward motion. Determine the force exerted by the jet on the plate and the work done.	Comprehension, Application	4
2	a) Give the classification of turbines. b) A jet of water of diameter 60mm moving with a velocity of 40 m/sec, strikes a curved fixed symmetrical plate at the centre. Determine the force exerted by the jet of water in the direction of the jet, if the jet is deflected by an angle of 160 degrees at the outlet of the curved plate.	Comprehension, Application	4
3	a) Define the following; i. Unit speed ii. Unit discharge iii. Unit power iv. Degree of reaction b) A Pelton wheel having a mean bucket diameter of 1.0 m is running at 1000 r.p.m. the side clearance angle is 150 and discharge through the nozzle is 0.1 m^3/s, determine power available at the nozzle and hydraulic efficiency of the turbine.	Application , Knowledge	4
4	a) Define the following efficiencies; i. Mechanical ii. Volumetric iii. Overall iv. Hydraulic b) A Pelton wheel is having a mean bucket diameter of 1 m and is running at 1000 rpm. The net head on the Pelton wheel is 700 m. if the side clearance angle is 15^0 and discharge through nozzle is $0.1m^3/s$, calculate: i. Power available at the nozzle, and ii. Hydraulic efficiency of the turbine.	Application , Knowledge	4
5	a) A jet of water 75 mm in diameter having velocity of 20 m/s strikes a series of the flat plates arranged around the periphery of a wheel such that each plate appears successively before the jet. If the plates are moving at a velocity of 5 m/s, calculate the force exerted by the jet on the plate, the work done per second on the plate and the efficiency of the jet. b) Derive an expression for force exerted by fluid jet on moving flat plate.	Synthesis, Application	4
6	a) A Pelton wheel is to be designed for the following specifications. Shaft power = 735.75 KW, head = 200 m, speed = 800 rpm, overall efficiency = 0.86 and jet diameter not to exceed $1/10^{th}$ of wheel diameter. Determine i. wheel diameter, ii. No. of jets required and iii. Diameter of jet. Take Cv=0.98	Application , Comprehension	4

	and Kv=0.45. b) Explain the function of draft tube.		
7	a) Draw and explain OC curves of turbines under constant head. b) A turbine is to operate under a head 25 m at 200 rpm. The discharge is 9 cumec. If the efficiency is 90% , determine the performance of the turbine under head of 20 m.	Analysis, Application	4
8	a) How to govern the impulse turbines? Explain with a neat sketch. b) A turbine develops 9000 KW when running at 100 rpm. The head on the turbine is 30 m. if the head on the turbine reduced to 18m, determine the speed and power developed by the turbine.	Application , Comprehension	4
9	a) Explain the terms; i. Cavitation and ii. Water hammer b) A Kaplan turbine develops 24647.6 KW power at an average head of 39 m. assuming speed ratio of 2, flow ratio of 0.6, diameter of the boss = 0.35 x diameter of the runner and an overall efficiency of 90%. Calculate the diameter, speed and specific speed of the turbine.	Application , Comprehension	4
10	a) Derive an expression for specific speed of a turbine. b) A Francis turbine with an overall efficiency of 75% is required to produce 148.25 KW power. It is working under a head of 7.62 m. the peripheral velocity = $0.26\sqrt{(2gH)}$ and the radial velocity of flow at inlet is $0.96\sqrt{(2gH)}$. The wheel runs at 150 rpm and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge determine; i. The guide blade angle, ii. The wheel vane angle at inlet and iii. Diameter of the wheel at inlet.	Synthesis, Application	4

UNIT-V

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
1	a) What is the necessity of priming in centrifugal pumps? b) A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 rpm against a head of 25 m. 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.	Knowledge, Application	5
2	a) Give the classification of centrifugal pumps. b) A centrifugal pump delivers water against a net head of 14.5 m and a design speed of 1000 rpm. The vanes are curved back to an angle of 30^0 with the periphery. The impeller diameter is 300 mm and outlet width 50 mm. determine the discharge of the pump if manometric efficiency 95%.	Application , Comprehension	5
3	a) Differentiate between centrifugal and reciprocating pumps. b) The diameter of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. Determine the minimum starting speed of the pump, if it works against a head of 30 m.	Application , Comprehension	5
4	a) Define NPSH in pumps. b) The diameters of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. The velocity of flow at outlet is 2 m/s and the vanes are set back at angle of 45^0 at the outlet. Determine the minimum starting speed of the pump, if the manometric efficiency is 70%.	Knowledge, Application	5
5	a) Explain the importance of multistage centrifugal pump. b) A four stage centrifugal pump has four identical impellers keyed to the same shaft. The shaft is running at 400 rpm and the total manometric head developed by the multistage pump is 40 m. The discharge through the pump is 0.2 m^3/s. the vanes of each impeller are having outlet angle as45^0. If the width and diameter of each impeller at outlet is 5 cm and 6 cm respectively. Calculate the manometric efficiency.	Application , Comprehension	5
6	a) Explain the working of a reciprocating pump with a neat sketch. b) A double acting reciprocating pump running at 40 rpm is discharging 1 m^3 of water per minute. The pump has a stroke of 400 mm. the diameter of the piston is 200 mm. the delivery and suction heads are 20 m and 5 m respectively. Determine the slip of the pump and the power required to drive the pump.	Application , Comprehension	5
7	a) What is the function of an air vessel in reciprocating pumps? b) A single stage centrifugal pump with impeller diameter of 30 cm rotates at 2000 rpm and lifts 3 m^3 of water per second to a height of 30 m with an efficiency of 75%. Calculate the no. of stages and diameter of each impeller of a similar multistage pump to lift 5 m^3 of water per second to a height of 200 m when rotating at 1500 rpm.	Knowledge, Application	5

8	a) Determine the number of pumps required to take water from a deep well under a total head of 89 m all the pumps are identical and running at 800 rpm. The specific speed of each pump is given as 25 while the rated capacity of each pump is 0.16 m^3/s. b) Draw and explain characteristic curves of centrifugal pumps.	Application, Analysis	5
9	a) Derive an expression for work done by the centrifugal pump. b) A single-acting reciprocating pump running at 30 r.p.m., delivers 0.012 m^3/s of water. The diameter of the piston is 25 cm and stroke length 50 cm. Determine: i. The theoretical discharge of the pump ii. Co-efficient of discharge, and iii. Slip and percentage slip of the pump.	Synthesis, Application	5
10	a) Define the following; i. Manometric efficiency ii. Mechanical efficiency and iii. Overall efficiency. b) A single-acting reciprocating pump has a plunger of diameter 250 mm and stroke of 350 mm. if the speed of the pump is 60 rpm and it deliver 16.5 lps of water against a suction head of 5 m and a delivery head of 20 m. Determine the theoretical discharge, coefficient of discharge, the slip, the percentage of slip and the power required to drive the pump.	Analyze	5