

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Third Semester

Mechanical Engineering

CE3391- Fluid Mechanics and Machinery

Regulations - 2021

Duration : 3 Hrs

Maximum : 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10X2=20)

Q.No	Questions	BLT	CO	Marks
1.	Mention the general properties of fluids.	L1	1	2
2.	Write Bernoulli's equation for real fluid.	L1	1	2
3.	Compare Laminar and Turbulent flow.	L2	2	2
4.	List the factors influencing the frictional loss in pipe flow?	L2	2	2
5.	Define dimensional homogeneity.	L1	3	2
6.	State Buckingham's Π theorem	L1	3	2
7.	Classify different types of turbine.	L1	4	2
8.	Write the function of draft tube in reaction turbine.	L2	4	2
9.	What is the slip in reciprocating pump?	L2	5	2
10.	Mention the main components of Centrifugal pump	L2	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No	Questions	BLT	CO	Marks
11.	a (a) Calculate the dynamic viscosity of an oil which is used for lubrication between a square plate of size 0.8m x 0.8 m in an inclined plane with an angle of inclination 30° to the horizontal. The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3m/s. The thickness of the oil film is 1.5mm (b) oil of sp. gravity 0.8 is flowing through venturimeter having inlet dia 20cm and throat dia 10cm. The oil – mercury differential manometer shows a reading of 25cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$.	L3	1	16
	Or			
	b Determine the viscous drag torque and power absorbed on one surface of collar bearing of 0.2m ID and 0.3 m OD with a oil film thickness of 1mm and viscosity of 30 centi-poise if it rotates at 500 rpm.	L3	1	16

12.	a	A 30 cm diameter pipe of length 30 cm is connected in series to a 20 cm diameter pipe of length 20 cm to convey discharge. Find the equivalent length of pipe of diameter 25 cm, assuming that the Friction factor remains the same and the minor losses are negligible.	L3	2	16
		Or			
	b	Derive an expression for Darcy–Weisbach formula to determine the head loss due to friction. Give the expression for relation between friction factor 'f' and Reynolds's number 'Re' for laminar and turbulent flow.	L3	2	16
13.	a	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 . By using dimensional analysis, obtain an expression for the pressure difference ΔP .	L3	3	16
		Or			
	b	Convective heat transfer coefficient in free convection over a surface is found to be influenced by the density, viscosity, thermal conductivity, coefficient of cubical expansion, temperature difference, gravitational acceleration, specific heat, the height of surface and flow velocity. Using dimensional analysis, determine the dimensionless parameters that will correlate the phenomenon.	L3	3	16
14.	a	A Pelton wheel, working under a head of 500 m develops 13 MW when running at a speed of 430 rpm. If the efficiency of the wheel is 85%, determine the rate of flow through the turbine, the diameter of the wheel and the diameter of the nozzle. Take speed ratio as 0.46 and coefficient of velocity for the nozzle as 0.98.	L4	4	16
		Or			
	b	A reaction turbine works at 450 r.p.m. under a head of 120 m. Its diameter at inlet is 1.2 m and the flow area is 0.4 m ² . The angles made by absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Determine: (i) the volume rate of flow, (ii) the power developed, and (iii) the hydraulic efficiency.	L4	4	16
15.	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 250mm. Its width at outlet is 50mm and the manometric efficiency is 75%. Find the vane angle at outer periphery of the impeller	L4	5	16
		Or			
	b	A double acting reciprocating pump running at 60 rpm is discharging 1.5 m ³ of water per minute. The pump has a stroke length of 400 mm. The diameter of the piston is 250 mm. The delivery and suction heads are 20m and 5m respectively. Find the power required to	L4	5	16

drive the pump and the slip of the pump.