Roll no. .....

B.Tech. (Sections – A, B & F)
Semester –II, Examination 2022
Basic of Mechanical Engineering
Paper No : ME-101

Time : Three Hours ***M.M. 45***

Instruction: Write your Roll No. on the top immediately on receipt of this question paper. Answer all the questions. Assume missing data, if any. All questions carry equal marks.

Q.1. CO1	a) Derive steady flow energy equation and deduce it for turbine, pump, nozzle and heat exchangers.	**(6)**
Q.1. CO1	b) Explain Perpetual Motion Machine kind 1 and 2 with suitable diagram. Also prove that energy is a property of the system.	**(3)**
Q.2. CO2	a) A reversible heat engine operates between two reservoirs at temperatures of 600°C and 40°C. The engine drives a reversible refrigerator which operated between reservoirs at temperatures of 40°C and -20°C. The heat transfer to the heat engine is 2000kJ and the net work output of the combined engine refrigerator plant is 360kJ. (i) Evaluate the heat transfer to the refrigerant and the neat heat transfer to the reservoir at 40°C. (ii) Reconsider –(i) given that the efficiency of the heat engine and the COP of the refrigerator are each 40% of their maximum possible values.	**(6)**
Q.2. CO2	b) State and explain the second law of threnody names given by Kelvin and Clausius.	**(3)**
Q.3. CO3	a) One kg of ice at -5°C is exposed to the atmosphere which is at 20°C. The ice melts and comes into thermal equilibrium with the atmosphere. (i) Determine the entropy increase of the universe.	**(6)**

	(ii) What is the minimum amount of work necessary to convert the water back into ice at -5°C? C_p of ice s 2.093kJ/kg Kand the latent heat of fusion of ice is 333.3kJ/kg.	
Q.3. CO3	b) Determine the viscosity of a liquid having kinematic viscosity 6 stokes and specific gravity 1.9?	(3)
	OR	
Q.3'. CO3	a) Water flows through a turbine in which friction causes the water temperature to rise from 35°C to 37°C. If there is no heat transfer, how much does the entropy of the water change in passing through the turbine? (Water is incompressible and the process can be taken to be a constant volume).	(6)
Q.3'. CO3	b) Determine the specific gravity of a fluid having viscosity 0.05 poise and kinematic viscosity 0.035 stokes.	(3)
Q.4. CO4	a) The velocity vector in a fluid flow is given by: $V = 4x^3i - 10x^2yj + 2tk$ Find the velocity and acceleration of fluid particle at (2, 1, 3) at time t=1.	(5)
Q.4. CO4	b) The diameter of a pipe at the section 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 and 5m/s. Also determine the velocity at section 2.	(4)
Q.5. CO5	a) Derive Euler's equation of motion and obtain Bernoulli's equation from it.	(6)
Q.5. CO5	b) A pipe, through which water is flowing, is having diameters, 20 cm and 10 cm at the cross-section 1 and 2 respectively. The velocity of water at the section 1 is 4 m/s. Find the velocity head at the section 1 and 2 and the rate of discharge. **OR**	(3)

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Q.5'. CO5	a) Derive the expression for the rate of flow through the venture meter.	**(6)**
Q.5'. CO5	b) A Pilot-static tube placed in the centre of a 300 mm pipe line has one orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 80 times the central velocity. Find the discharge through the pipe if the pressure difference between two orifices is 60 mm of water. Take the co-efficient of Pilot tube as C_v=0.98.	**(3)**