Reg. No.												

Question Paper Code	12026

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

Third Semester

Mechanical Engineering

(Common to Electronics and Instrumentation Engineering & Instrumentation and Control Engineering)

20ESME301 - APPLIED THERMODYNAMICS AND FLUID MECHANICS

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Write down the SFEE for a nozzle.	*2,K1,CO1*
2.	What is heat pump? How does it differ from a refrigerator?	*2,K2,CO1*
3.	Draw the P-V and T-s diagram of Diesel cycle.	*2,K2,CO2*
4.	What is the function of boiler mountings?	*2,K1,CO3*
5.	What is the importance of kinematic viscosity?	*2,K1,CO5*
6.	List the applications of Bernoulli's equation.	*2,K1,CO5*
7.	What is the need for dimensional analysis for fluid mechanics?	*2,K2,CO4*
8.	Write the significance of the Weber number.	*2,K1,CO4*
9.	Define the manometric head and write down the formula used for calculation.	*2,K2,CO6*
10.	What is the function of air-vessels?	*2,K1,CO6*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	A centrifugal air-compressor delivers 15 kg of air per minute. The inlet and outlet conditions of air are C_1 = 10m/s, p_1 = 1 bar, v_{s1} = 0.5 m^3/kg and C_2 = 80 m/s, p_2 = 7 bar, v_{s2} = 0.15 m^3/kg. The increase in enthalpy of air passing through the compressor is 160 kJ/kg and heat loss to the surroundings is 720 kJ/min. Find the ratio of inlet to outlet diameter. Assume that inlet and discharge lines are at the same level.	*13,K3,CO1*
		OR	
	b)	A gas compressed in a cylinder is compressed from 1 MPa and 0.05 m^3 to 2 MPa. Compression is governed by $pV^{1.4}$ = constant. The internal energy of a gas is given by; U = 7.5 PV – 425, kJ. Where p is pressure in kPa and V is the volume in m^3. Determine heat, work, and change in internal energy assuming the compression process is to be quasi-static.	*13,K3,CO1*

12. a) An engine working on Otto cycle has a volume of 0.45 m^3, pressure 1 bar and temperature 30°C at the beginning of compression stroke. At the end of compression stroke, the pressure is 11 bar. 210 kJ of heat is added at constant volume. Determine : *13,K3,CO2*
(i) Pressures, temperatures and volumes at salient points in the cycle.
(ii) Percentage clearance.
(iii) Efficiency.

OR

b) Explain with neat sketch of simple Rankine cycle. *13,K2,CO2*

13. a) Explain with neat sketches any two of the following boiler accessories: *13,K2,CO3*
(i) Injector; (ii) super heater; (iii) Air preheated; (iv) Economizer.

OR

b) Explain with neat sketch any three of the following mounting: *13,K2,CO3*
(i) Water level indicator (ii) Pressure gauge (iii) Feed check value
(iv) Blow of cock (v) High steam and low water safety value.

14. a) State Buckingham's π theorem. What do you mean by repeating variables? How are the repeating variables selected in dimensional analysis? *13,K2,CO4*

OR

b) 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. *13,K3,CO4*

15. a) Explain the working principle of reaction turbine. *13,K2,CO6*

OR

b) Explain the construction and working principle of centrifugal pump with neat sketch. *13,K2,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) Water flows through a pipe AB 1.2m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter at C, the pipe branches. Branch CD is 0.8m in diameter and carries one third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE. *15,K3,CO5*

OR

b) The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 lit/sec. the section 1 is 6m above datum. If the pressure at section 2 is 4m above the datum. If the pressure at section 1 is 39.24 N/cm2, find the intensity of pressure at section 2. *15,K3,CO5*