Reg. No.															

Question Paper Code	12923

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Third Semester

Electronics and Instrumentation Engineering

(Common to 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.	What is meant by thermodynamic equilibrium?	2	K1	CO1
2.	A heat engine with a thermal efficiency of 45% rejects 500 kJ/kg of heat, How much heat does it receive?	2	K2	CO1
3.	Draw the Otto cycle on P-v and T-s Diagrams.	2	K2	CO2
4.	Write the assumptions made for air standard cycle.	2	K1	CO2
5.	Write any four Boiler Accessories.	2	K1	CO3
6.	Determine the dimension of the following quantities: (i) Discharge (ii) Force (iii) Density	2	K1	CO3
7.	What are the similarities between model and prototype?	2	K1	CO5
8.	List the types of fluid flow.	2	K1	CO5
9.	State the assumptions used in deriving Bernoulli's equation.	2	K1	CO6
10.	What is meant by Priming?	2	K1	CO6

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Air flows steadily at the rate of 0.5 kg/s through an air compressor entering at 7 m/s velocity, 100 kPa pressure, and 0.95 m^3/kg specific volume, and leaving at 5 m/s, 700 kPa, and 0.19 m^3/kg. The internal energy of air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorb heat at the rate of 58 kW. Estimate: the rate of shaft work input to the compressor.	13	K2	CO1
		OR			
	b)	Two reversible heat engines A and B are arranged in series. A rejecting heat directly to B. Engine receives 200 KJ at a temperature of 421º C from a hot source, while engine B is in communication with a cold sink at a temperature of 4.4º C. If the work output of A is twice that of B, Identify the intermediate temperature between A and B; Identify the Efficiency of each engine.	13	K2	CO1

12.	a)	Derive the expression for air standard efficiency of Otto cycle with p-V and T-S diagrams.	*13*	*K3*	*CO2*
		OR			
	b)	Calculate the air standard efficiencies for the Otto and Diesel cycles on the basis of equal compression ratio of 10 and equal heat rejection of 840 kJ/kg. The suction conditions are 1 bar and 328 K.	*13*	*K2*	*CO2*
13.	a)	Explain with neat sketch the following mounting: (i) Water level indicator (ii) Pressure gauge (iii) Feed check value (iv) Blow of cock .	*13*	*K2*	*CO3*
		OR			
	b) i)	Explain any three the factors affecting the selection of boiler.	*6*	*K2*	*CO3*
	ii)	Differentiate fire tube boiler and water tube boiler.	*7*	*K2*	*CO3*
14.	a)	State and prove the Pascal's law.	*13*	*K2*	*CO5*
		OR			
	b) i)	Calculate the specific weight, density and specific gravity of 1 liter of liquid which weighs 7 N.	*6*	*K2*	*CO5*
	ii)	Find the Kinematic viscosity of an oil having density 981 kg/m. The shear stress at a point in oil is 0.2452 N/m^2 and velocity gradient at that point is 0.2 /sec.	*7*	*K2*	*CO5*
15.	a)	Discuss characteristics curve, load efficiencies of turbines.	*13*	*K2*	*CO6*
		OR			
	b)	Explain the working principle of single and double acting centrifugal pump with neat diagram in detail.	*13*	*K2*	*CO6*

PART - C (1 × 15 = 15 Marks)

16.	a)	The pressure difference Δp in a pipe of diameter D and length l due to turbine flow depends on the velocity v, viscosity μ, density ρ and roughness K. Apply Buckingham's phi theorem, obtain an expression for Δp.	*15*	*K3*	*CO4*
		OR			
	b)	Derive on basis of dimensional analysis suitable parameters to present the trust developed by a propeller. Assume that the 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 the speed of sound in the medium C.	*15*	*K3*	*CO4*