Register Number:……..

KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Third Semester

AUTOMOBILE ENGINEERING

U18AUT3103 : Thermodynamics and Thermal Engineering

COURSE OUTCOMES

CO1: Familiarize laws of Thermodynamics.
CO2: Apply energy balance to systems and control volumes, in situations involving heat and work interactions.
CO3: Compare the performance of thermal systems with idealized systems.
CO4: Make use of the properties of pure substance in vapour power cycles.
CO5: Solve problems using thermodynamic concepts related to air compressor, refrigeration and air conditioning.
CO6: Utilize modes of heat transfer to design thermal equipment.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Differentiate between open system, closed system and an isolated system with examples.	CO1	[K_1]
2.	Write the expressions for COP of a refrigerator and heat pump.	CO1	[K_2]
3.	Sketch the p-V and T-s diagram of dual cycle.	CO2	[K_2]
4.	Define volumetric efficiency.	CO2	[K_1]
5.	Draw the p-T diagram of a pure substance which expands on freezing.	CO3	[K_2]
6.	List the methods used to increase the ideal efficiency of Rankine cycle.	CO4	[K_1]
7.	Write any four desirable properties required for a good refrigerant.	CO5	[K_2]
8.	Name any four psychrometric processes used in air conditioning	CO5	[K_1]
9.	State Fourier's law of heat conduction.	CO6	[K_1]
10.	Compare Free convection and forced convection.	CO6	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	A cylinder contains 0.45 m^3 of a gas at 1×10^5 N/m^2 and 80°C. The gas is compressed to a volume of 0.13 m^3, the final pressure being 5×10^5 N/m^2. Determine i) mass of gas, ii) value of index 'n' for compression, iii) increase in internal energy of the gas, iv) The heat received or rejected by the gas during compression.	16	CO1	[K_3]

12.	a)	At the inlet to a certain nozzle the enthalpy of fluid passing is 2800 kJ/kg, and the velocity is 50 m/s. At the discharge end the enthalpy is 2600 kJ/kg. The nozzle is horizontal and there is negligible heat loss from it. i) Find the velocity at exit of the nozzle. ii) If the inlet area is 900 cm^2 and the specific volume at inlet is 0.187 m^3/kg, find the mass flow rate. iii) If the specific volume at the nozzle exit is 0.498 m^3/kg, find the exit area of nozzle.	16	CO2	[K_3]
13.	a)	In an air standard diesel cycle, the compression ratio is 15 and at the beginning of compression the working fluid is at 1 bar and 290 K. If the heat added equals 850 kJ/kg, determine i) maximum pressure and temperature of the cycle, ii) work done and mean effective pressure, and iii) air standard efficiency.	16	CO3	[K_3]
14.	a)	In a Rankine cycle, the steam at inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Determine i) pump work, ii) turbine work, iii) Rankine efficiency, iv) condenser heat flow, v) dryness at the end of expansion. Assume flow rate of 9.5 kg/s.	16	CO4	[K_3]
15.	a)	The sling psychrometer in laboratory recorded the following readings: dry bulb temperature = 35^oC, Wet bulb temperature = 25^0C. Calculate i) specific humidity, ii) Relative humidity, iii) Vapour density of air, iv) dew point temperature. Take atmospheric pressure = 1.0132 bar.	8	CO5	[K_3]
	b)	Describe the construction and working of vapour compression refrigeration system with neat sketch.	8	CO5	[K_2]
16.	a)	Enumerate on various modes of heat transfer with examples.	8	CO6	[K_2]
	b)	Explain the classification of heat exchanger with neat sketches.	8	CO6	[K_2]

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