Reg. No.															

B.Tech. DEGREE EXAMINATION, DECEMBER 2023

Fourth Semester

18AUC203T – APPLIED THERMAL ENGINEERING FOR AUTOMOTIVE ENGINEERS

(For the candidates admitted from the academic year 2020-2021 to 2021-2022)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours | Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

	Marks	BL	CO
1. The cycle is also known as _____for diesel. (A) Constant volume cycle (B) Constant pressure cycle (C) Constant temperature cycle (D) High temperature cycle	1	1	1
2. A four stroke engine running at 6000 rpm has _____power strokes per minute. (A) 2000 (B) 3000 (C) 4000 (D) 6000	1	2	1
3. For the same compression ratio, a _____ cycle has maximum efficiency. (A) Otto (B) Diesel (C) Dual (D) Carnot	1	1	1
4. During heat addition, the entropy usually _____ (A) Remains constant (B) Decreases (C) Increases (D) Decreases and then increases	1	1	1
5. Brake power is the power available (A) In the cylinder (B) At the engine output shaft (C) During combustion (D) At the front brake	1	1	2
6. Specific fuel consumption is given by (A) ma/IP (B) ma/BP (C) mf/IP (D) mf/BP	1	1	2
7. Morse test cannot be used on an engine with _____cylinders. (A) One (B) Four (C) Six (D) Ten	1	1	2
8. Morse test is used to find (A) Frictional power (B) Indicated power (C) Brake power (D) Thermal efficiency	1	1	2

9. For a cylinder, the critical radius is given by 1 3 3
   (A) 2K/h (B) K/2h
   (C) K/h (D) 3K/h

10. The most efficient method of compressing any gas is _____compression. 1 2 3
   (A) Isentropic (B) Isochoric
   (C) Isothermal (D) Adiabatic

11. Free convection occurs due to 1 1 3
   (A) Random free electrons (B) Density difference caused by temperature gradients
   (C) Molecular spin (D) External stirring

12. Heat transfer coefficient is maximum for the following material at room temperature 1 1 3
   (A) Zinc (B) Aluminium
   (C) Brass (D) Carbon steel

13. Heat from the refrigerated volume of a refrigerator is removed by a _____ 1 1 4
   (A) Compressor (B) Condenser
   (C) Expansion valve (D) Evaporator

14. Ideally, the gas entering a refrigerator compressor should be _____ 1 2 4
   (A) Mixed with water (B) Completely dry vapour
   (C) At high velocity (D) Cooled below saturation point

15. The dry bulb temperature lines on a psychrometric chart are _____ 1 2 4
   (A) Horizontal lines (B) Vertical lines
   (C) Inclined at 45° (D) Exponential curves

16. The thermal conductivity of air _____with rise in temperature. 1 1 4
   (A) Increases (B) Remains constant
   (C) Increases (D) Is independent

17. During heating and humidification, _____ increases. 1 1 5
   (A) Relative humidity (B) Specific humidity
   (C) Specific mass of air (D) Flow velocity

18. At 100% relative humidity, the wet bulb temperature is _____than _____temperature. 1 1 5
   (A) Lower, dew point (B) Equal, dew point
   (C) Higher, dry bulb (D) Higher, dew point

19. The performance of a refrigerator is described by 1 1 5
   (A) Power supplied to compressor (B) Thermal efficiency
   (C) Expansion ratio (D) Coefficient of performance

20. In a summer air conditioning system, the following component is not necessary 1 1 5
   (A) Cooling coil (B) Humidifier
   (C) Fan or blower (D) Heating coil

PART – B (5 × 4 = 20 Marks)

Answer **ANY FIVE** Questions

		Marks	BL	CO
21.	State the assumptions made for air standard cycles.	4	1	1
22.	Draw the PV and T-S diagrams for otto cycle.	4	1	1
23.	Differentiate between indicated power and brake power.	4	2	2
24.	Describe Willan's line method.	4	3	1
25.	Derive the expression for finding the critical radius of a cylinder.	4	4	1
26.	Why is multi stage compression necessary?	4	5	1
27.	Write a short note on dehumidification. Write is it necessary.	4	5	1

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

		Marks	BL	CO
28. a.	Derive the air standard efficiency of an otto cycle.	12	2	1
	(OR)			
b.	The minimum pressure and temperature in an otto cycle are 100 kPa and 27°C. The heat added per cycle is 1500 kJ/kg. Determine the thermal efficiency and the pressure and temperature at all salient points.	12	3	1
29. a.	Explain the basic performance parameters of IC engines with suitable sketches.	12	2	2
	(OR)			
b.	A single cylinder, 4 stroke oil engine has the following parameters. Cylinder diameter = 20 cm Stroke length = 40 cm Indicated MEP = 6 bar Torque = 407 Nm Speed = 250 rpm Oil consumption = 4 kg/hour Calorific value of oil = 43 MJ/kg Cooling water flow rate = 4.5 kg/minute. Air used per kg of fuel = 30 kg Change in water temp. from inlet to outlet = 45°C Temp. of exhaust gas = 420°C Ambient air temp. = 20°C Specific heat of exhaust gas = 1 kJ/kg.K Find the values of IP and BP. Prepare a heat balance sheet in kJ/hour.	12	3	2
30. a.	Derive the expression for heat conducted through a composite wall from the steady sate equation.	12	2	3
	(OR)			

b.	Determine the heat required in a parallel flow heat exchanger to cool oil from 60°C to 30°C using water at 20°C. The outlet temperature of water is 26°C. The oil flows at the rate of 10 kg/s and has a specific heat of 2200 J/kg.K. The overall heat transfer coefficient is U=300 W/m^2K. Also find the area required for a counter flow heat exchanger with the above data.	12	3	3
31. a.	Explain the construction and working of a single acting air compressor with a neat sketch.	12	2	4
	(OR)			
b.	Prepare a report on the working of vapour compression refrigeration system with neat sketches.	12	2	4
32. a.	Explain the working of winter air conditioning system.	12	2	5
	(OR)			
b.	Write short notes on (i) Sensible cooling (ii) Sensible heating	12	2	5

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