A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 94702

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2024

Fourth Semester

Mechanical Engineering

19UME402 - Applied Thermal Engineering

(Regulations 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Constant pressure cycle is CO1- U

(a) Otto cycle (b) Dual cycle (c) Diesel cycle (d) Brayton cycle

2. Heat addition takes place in diesel cycle at CO1- U

(a) V=C (b) P=C (c) T=C (d) S=C

3. Valve mechanism exists in CO1- U

(a) 2-stroke engine (b) 6-stroke engine (c) 4-stroke engine (d) High speed engine

4. Spark plug is used in CO1- U

(a) Petrol engine (b) Marine engine (c)Diesel engine (d)Stirling engine

5. The steam governor is used to CO1- U

(a) Store energy (b) Convert energy (c) Maintain speed (d) Balancing weight

6. A nozzle is used to CO1- U

(a) Increase velocity (b) decrease velocity

(c) Increase pressure (d) Decrease pressure

7. Positive displacement compressor CO1- U

(a) Centrifugal compressor (b) Axial compressor

(c) Reciprocating compressor (d) Roots blower

8. The volume of air sucked by the compressor during its suction stroke is — CO1- U

(a) free air delivery (b) swept volume

(c) compressor capacity (d) none of these

9. The formation of frost on cooling coils in a refrigerator — CO5- U

(a) increases heat transfer (b) improves C.O.P. of the system

(c) increases power consumption (d) reduces power consumption

10. The leakage of refrigerant from a system is detected by — CO5- U

(a) halide torch test (b) sulphur candle test

(c) soap and water test (d) all of these

PART – B (5 x 2= 10 Marks)

11. Illustrate the assumption made in deriving the air-standard efficiency of Carnot engine. — CO1- U

12. Summarize major parts of I.C. Engines. — CO1- U

13. What are the different loss involved in Steam Turbine — CO1- U

14. Classify the various types of air-compressors. — CO1- U

15. Classify four important properties of a good refrigerant — CO1- U

PART – C (5 x 16= 80 Marks)

16. (a) Explain the Otto cycle with P-V and T-S diagram and derive the expression for air standard efficiency of the Otto cycle. — CO2- App — (16)

Or

(b) Explain the Diesel cycle with P-V and T-S diagram and derive the expression for air standard efficiency of the Diesel cycle. — CO2- App — (16)

17. (a) Explain the working of Simple carburetor with neat sketch — CO1- U — (16)

Or

(b) Explain about full pressure lubrication system in I.C Engine. — CO1- U — (16)

18. (a) Dry saturated steam enters a steam nozzle at a pressure of 12 bar and is discharged to a pressure of 1.5 bar. If the dryness fraction of a discharged steam is 0.95, what will be the final velocity of steam? Neglect initial velocity of steam. — CO3- App — (16)

Or

(b) Steam at 20 bar and 250°C enter a group of convergent – divergent nozzles. The backup pressure of nozzle is 0.07 bar. Neglect the losses in the convergent part. Assume a loss of 10% of enthalpy drop available in the divergent part. Find the number of the nozzles required to discharge 13.6 kg/s. the throat area of each nozzles is 3.97cm^2. Also determine the the area of exits of each nozzle. CO3- App (16)

19. (a) A single acting reciprocating air compressor has cylinder diameter and stroke of 200mm and 300mm respectively. The compressor sucks air at 0.97 bar and 27^0 C and delivers at 5.6 bar while running at 600 rpm. The atmospheric conditions are 1.01 bar and 17°C . The clearance volume is 4% of the swept volume Find (i) Indicated power of the compressor (ii) free of air delivered by the compressor per min. (iii) volumetric efficiency referred to free conditions. The compression follows the law PV $^{1.3}$ = C. CO6- App (16)

Or

(b) A single stage single acting air compressor delivers 15m^3 of free air per minute from 1 bar to 8 bar. The speed of compressor is 300 rpm. Assuming that compression and expansion follow the law pv $^{1.3}$=c and clearance is 1/16th of swept volume, find the diameter and the stroke of the compressor. Take L/D = 1.5. The temperature and pressure of air at the suction are 20°C and 1 bar respectively. CO4- Ana (16)

20. (a) Explain the Concepts of RSHF, GSHF and ESHF CO5- App (16)

Or

(b) In a simple vapor compression cycle, the following are the properties of the refrigerant R-12 at various points compressor inlet h_2 = 183.2 kj/kg , v_2 = 0.0767 m^3 /kg , compressor discharge h_3 = 222.6 kj/kg v_3 = 0.0164 m^3 /kg , compression exit h4 = 84.9 kj/kg v_4 = 0.0083 m3/kg. compressor exit : h_4= 84.9kj/kg v_4 = 0.00083 m^3/kg. The piston displacement volume for compressor is 1.5 litre per stroke and its volumetric efficiency is 80%. The speed of the compressor is 1600 rpm. Find CO5- App (16)

(i) power rating of the compressor

(ii) refrigerant effect

94702