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Reg. No. :

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B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Fourth Semester

Mechanical Engineering

15UME404 - THERMAL ENGINEERING

(Regulation 2015)

(Steam Table and Refrigeration tables are permitted)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The compression ratio of an IC engine is the ratio of   CO1- R

    (a) swept volume to clearance volume

    (b) total cylinder volume to clearance volume

    (c) total cylinder volume to swept volume

    (d) pressure after compression to that before compression

2. Which of the following cycle has the highest efficiency ?   CO1- R

    (a) Otto cycle   (b) Carnot cycle   (c) Stirling cycle   (d) Joule cycle

3. A carburetor is used to supply   CO2- R

    (a) Petrol ,air and lubrication oil   (b) Air and diesel

    (c) Petrol and lubricating oil   (d) Petrol and air

4. Piston compression rings are made of   CO2- R

    (a) cast iron   (b) bronze   (c) aluminum   (d) white metal

5. The flow of steam is super sonic   CO3- R

    (a) At the entrance to the nozzle   (b) At the throat of the nozzle

    (c) In the convergent portion of the nozzle   (d) In the divergent portion of the nozzle

6. What factor limits the maximum temperature in a gas turbine cycle   CO3- R

   (a) quality of fuel   (b) combustion efficiency

   (c) turbine blade material   (d) rotational speed of turbine blade

7. The absolute pressure of air at the outlet of a compressor is called   CO4- R

   (a) Back pressure   (b) Critical pressure   (c) Discharge pressure   (d) None of these

8. Roots blower is an example of   CO4- R

   (a) reciprocating compressor   (b) rotary compressor

   (c) centrifugal compressor   (d) axial flow compressor

9. In refrigerating machine ,heat rejected is_____heat absorbed   CO5- R

   (a) Equal to   (b) Less than   (c) Greater than   (d) None of these

10. Identify the refrigerant with maximum boiling point   CO5- R

   (a) ammonia   (b) carbon di-oxide   (c) Freon - 12   (d) Freon - 22

<div align="center">PART – B (5 x 2= 10 Marks)</div>

11. Sketch the dual cycle on PV and TS diagram and name the various processes.   CO1- R

12. What do you mean by scavenging in IC engine.   CO2- R

13. What is metastable flow.   CO3- R

14. Define the term isothermal compressor efficiency   CO4- R

15. What is meant by sub cooling in vapour compression system..   CO5- R

<div align="center">PART – C (5 x 16= 80Marks)</div>

16. (a)   In an air standard dual cycle the pressure and temperature at the   CO1- App   (16)
beginning of compression are 1bar and 47°c respectively. The
heat supplied in the cycle is 1250KJ/Kg two third of this being
added at constant volume and rest at constant pressure. If the
compression ratio is 16, determine the maximum pressure,
temperature in the cycle, thermal efficiency and mean effective
pressure.

<div align="center">Or</div>

(b)   Derive an expression for the air standard efficiency of Brayton   CO1- App   (16)
cycle in terms of pressure ratio also suggest the methods of
improvement of efficiency.

17. (a)   Describe the working of electronic ignition system and how it   CO2- U   (16)
differ from other ignition system.

Or

(b) What are the different methods of lubricating IC engine ? Explain the pressure system of lubrication with a neat sketch .   CO2- U   (16)

18. (a) Drive the expression for the critical pressure ratio in a steam nozzle.   CO3- Ana   (16)

Or

(b) Explain the pressure and velocity compounding diagram of a multi stage turbine with sketch.   CO3- U   (16)

19. (a) The free air delivery of a single cylinder single stage reciprocating air compressor is $2.5 m^3$/min. The ambient air is at STP conditions and delivery pressure is 7bar. The clearance volume is 5% of the stroke volume and the law of compression and expansion is $PV^{1.25} = C$. If L =1.2D and the compressor runs at 150rpm, determine the size of the cylinder.   CO4- U   (16)

Or

(b) Explain the construction and working principles of multistage compressor and discuss the perfect and imperfect inter cooling with neat sketch.   CO4- U   (16)

20. (a) Explain the working of Lithium bromide refrigeration system.   CO5- U   (16)

Or

(b) Describe the working of summer air conditioning system suitable for hot and wet weather and for hot and dry weather with simple component diagram.   CO5- U   (16)

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