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Question Paper Code: 54704

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

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 efficiency of air standard Otto cycle depends on CO1- R
(a) pressure ratio (b) temperature ratio
(c) compression ratio (d) mean effective pressure
2. Gas power cycle is not used for CO1- R
(a) Diesel cycle engine (b) Otto cycle engine
(c) Locomotive engine (d) Aircraft engine
3. The function of venturi in carburatter is CO2- R
(a) to decrease the air velocity (b) to increase the velocity
(c) to decrease the fuel low (d) to increase the manifold vacuum
4. By use of cooling, which efficiency of an IC engine decreases CO2- R
(a) volumetric efficiency (b) mechanical efficiency
(c) charging efficiency (d) thermal efficiency

5. A nozzle is designed for CO3- R
 (a) maximum pressure at the outlet (b) maximum discharge
 (c) maximum pressure and maximum discharge (d) maximum kinetic energy at outlet
6. In an impulse turbine, steam expands CO3- R
 (a) in the nozzle only (b) in the moving blades only
 (c) in the fixed and moving blades (d) none of the above
7. Air receiver in an compressor is used to CO4- R
 (a) cool the air after compression (b) eliminate the pulsation
 (c) supply the air to utility (d) to separate the moisture
8. The clearance volume in a reciprocating air compressor CO4- R
 (a) reduces work input (b) reduces suction capacity
 (c) reduces discharge pressure (d) all of the above
9. When the rate of evaporation of water is zero, the relative humidity of CO5- R
 the air is
 (a) 0% (b) 100% (c) 50% (d) unpredictable
10. In summer air-conditioning, RH of conditioned space is generally kept CO5- R
 (a) 40% (b) 50% (c) 60% (d) 100%

PART – B (5 x 2= 10Marks)

11. Define compression ratio. CO1- R
12. Compare petrol and diesel engines. CO2- R
13. What is the function of a steam nozzle? CO3- R
14. Why is the intercooler provided between stages? CO4- R
15. Classify the air-conditioning systems. CO5- R

PART – C (5 x 16= 80Marks)

16. (a) A four stroke, four cylinder petrol engine of 250 mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.01052 m^3 . The initial pressure and temperature are 1 bar and 47°C . If the maximum pressure is limited to 25 bar. Find the following:
1. The air standard efficiency of the cycle
 2. The mean effective pressure

Or

- (b) A high speed oil engine operating on a dual combustion cycle has a pressure of 1 bar and a temperature of 50°C before compression. Air is then compressed isentropically to $1/15^{\text{th}}$ of its original volume. The maximum pressure is twice the pressure at the end of isentropic compression. If the cut off ratio is 2, determine the temperature at the end of the each process and ideal efficiency of the cycle. Take $\gamma = 1.4$.

17. (a) Explain the battery ignition system with a neat diagram. CO2- App (16)

Or

- (b) What are the harmful effects of overheating of an engine? Discuss water cooling system for an internal combustion engine. CO2- Ana (16)

18. (a) Calculate the throat and exit diameters of a convergent – divergent nozzle, which will discharge 820 kg of steam per hour at a pressure of 8 bar superheated to 220°C in to a chamber having a pressure of 1.5 bar. The friction loss in the divergent portion of the nozzle may be taken as 0.15 of the isentropic enthalpy drop. CO3- Ana (16)

Or

- (b) Explain the working of an impulse reaction turbine. CO3- Ana (16)

19. (a) (i) Explain the working of a single acting reciprocating air compressor and derive work done/Kg of air compressed without clearance. CO4-U (12)
- (ii) State the advantages of multi-stage compression. CO4-U (4)

Or

- (b) In a three stage compressor, air is compressed from 98 kPa to 20 bar. Calculate for 1 m^3 of air per second. CO4- Ana (16)
- (a) Work under ideal condition for $n=1.3$
 - (b) Isothermal work
 - (c) Saving in work due to multi staging
 - (d) Isothermal efficiency.

20. (a) Draw neat sketch of simple vapor compression refrigeration system and explain. CO5- U (16)

Or

- (b) Explain the following: CO-5 U (16)
- (a) RSHF
 - (b) GSHF
 - (c) ESHF