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**Question Paper Code: 44704**

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Fourth Semester

Mechanical Engineering

14UME404 - THERMAL ENGINEERING

(Regulation 2014)

Duration: 1:15hrs

Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

**(Answer any six of the following questions)**

- The thermodynamic cycle working with air as working cycle is known as
  - induction stroke
  - compression stroke
  - power stroke
  - exhaust stroke
- Constant volume cycle refers to
  - Diesel cycle
  - Brayton cycle
  - Otto cycle
  - Dual cycle
- The power developed inside the cylinder is called
  - Mechanical efficiency
  - Brake power
  - Indicated power
  - Thermal efficiency
- Carburettor is used for
  - S.I. engines
  - Gas engines
  - C.I. engines
  - None of the above
- Increasing the velocity and decreasing the pressure is done by
  - Diffuser
  - Turbine
  - Compressor
  - Nozzle
- De-Laval turbine is an example of
  - Impulse turbine
  - Reaction turbine
  - Low head turbine
  - Middle head turbine

7. For complete intercooling, the temperature at the inlet and exit of the compressor are
- (a)  $T_i < T_e$                       (b)  $T_i > T_e$                       (c)  $T_i = T_e$                       (d)  $T_i \neq T_e$
8. In reciprocating air compressor, the method of controlling the quantity of air delivered is done by the
- (a) Throttle control                      (b) Clearance control  
(c) Blow off control                      (d) All the above
9. The C.O.P of an air refrigeration system is \_\_\_\_\_ a vapour compression system.
- (a) More than                      (b) Less than  
(c) Equal to                      (d) No such comparison
10. A sling psychrometer measures temperature of
- (a) Dry bulb                      (b) wet bulb  
(c) dew point                      (d) both dry bulb and wet bulb

PART – B (3 x 8= 24 Marks)

**(Answer any three of the following questions)**

11. The minimum pressure and temperature in an Otto cycle are  $100 \text{ kPa}$  and  $27^\circ\text{C}$ . The amount of heat added to the air per cycle is  $1500 \text{ kJ/kg}$ .
- (i) Draw the P-V diagram and calculate the pressures and temperatures at all points of the air standard Otto cycle.
- (ii) Also calculate the specific work and thermal efficiency of the cycle for a compression ratio of 8:1
- Take for air  $C_v = 0.72 \text{ kJ/kg}$  and  $\gamma = 1.4$ . (8)
12. Explain the working of 4 stroke cycle diesel engine with neat sketch. (8)
13. Evaluate the throat area, exit area and exit velocity for a steam nozzle to pass a mass flow of  $0.2 \text{ kg/s}$  when inlet conditions are  $10 \text{ bar}$  and  $250^\circ\text{C}$  and the final pressure is  $2 \text{ bar}$ . Assume expansion is isentropic and that the inlet velocity is negligible. Use  $pv^{1.3} = \text{constant}$ . (8)

14. A single stage double acting air compressor is required to deliver  $14 \text{ m}^3$  of air per minute measured at  $1.013 \text{ bar}$  and  $15^\circ\text{C}$ . The delivery pressure is  $7 \text{ bar}$  and the speed  $300 \text{ r.p.m.}$  Take the clearance volume as  $5\%$  of the swept volume with the compression and expansion index of  $n = 1.3$ . Estimate
- (i) swept volume of the cylinder
  - (ii) delivery pressure
  - (iii) indicated power (8)
15. Describe the construction and working of Ammonia-water vapour absorption refrigeration system. (8)