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Question Paper Code: 44704

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

Fourth Semester

Mechanical Engineering

14UME404 - THERMAL ENGINEERING

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- 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
- Which one of the following power is measured at the engine flywheel
 - Brake power
 - Indicated power
 - Friction power
 - Fuel power
- Carburettor is used for
 - S.I. engines
 - Gas engines
 - C.I. engines
 - None of the above
- The isentropic expansion of steam through nozzle for the steam initially dry saturated at inlet is approximated by the equation
 - $pv = C$
 - $pv^{1.4} = C$
 - $pv^{1.3} = C$
 - $pv^{1.135} = C$

6. De-Laval turbine is an example of
- (a) Impulse turbine (b) Reaction turbine
(c) Low head turbine (d) 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 ratio between Refrigerating effect and work done is called as
- (a) Ton of refrigeration (b) Compression refrigeration
(c) Coefficient of Performance (d) Absorption refrigeration
10. Human body feels comfortable when the heat produced by the metabolism of human body is equal to the
- (a) Heat dissipated to the surroundings (b) Heat stored in the human body
(c) Sum of (a) and (b) (d) Difference of (a) and (b)

PART - B (5 x 2 = 10 Marks)

11. Define air standard efficiency and mean effective pressure.
12. List the methods used to find the friction power.
13. Name the various types of nozzles.
14. What the use is of inter cooler?
15. Define C.O.P of a refrigerator.

PART - C (5 x 16 = 80 Marks)

16. (a) Illustrate the P-V diagram and T-S diagram of Diesel cycle and deduce the expression for air standard efficiency. (16)

Or

- (b) A four stroke SI engine has the compression ratio of 6 and swept volume of 0.15 m^3 . Pressure and temperature at the beginning of compression are 98 kPa and 60°C . Determine the pressure, volume and temperatures at all salient points if heat supplied is 150 kJ/kg. Also find out entropy change, work done, efficiency and mean effective pressure of cycle assuming $C_p = 1 \text{ kJ/kg}\cdot\text{K}$, $C_v = 0.71 \text{ kJ/kg}\cdot\text{K}$. Also plot the cycle on T-S diagram. (16)

17. (a) Explain the construction and working principle of any one of ignition system with neat sketch. (16)

Or

- (b) A 4 cylinder two stroke petrol engine develops 30 kW at 2500 r.p.m. The mean effective pressure on each piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder of stroke to bore ratio 1.5. Also calculate the fuel consumption of the engine, if the brake thermal efficiency is 28%. The calorific value of the fuel is 43900 kJ/kg. (16)

18. (a) Briefly discuss the pressure and velocity compounding in turbines. (16)

Or

- (b) (i) Differentiate between impulse turbine and reaction turbine. (8)
(ii) Describe briefly the various methods of steam turbine governing. (8)

19. (a) Develop an expression for the minimum work done by the multistage reciprocating air compressor with perfect intercooling. (16)

Or

- (b) Describe the construction and working of multi stage compressor and discuss the perfect and imperfect inter cooling. (16)

20. (a) An office is to be air-conditioned for 50 staffs when the outdoor conditions are 30°C DBT and 75% RH if the quantity of air supplied is $0.4\text{ m}^3/\text{min}/\text{person}$, find the following.
- (i) Capacity of the cooling coil in tons of refrigeration
 - (ii) Capacity of the heating coil in KW
 - (iii) Amount of water vapour removed per hour. Assume that required air inlet conditions are 20°C DBT and 60% RH, air is conditioned first by cooling and dehumidifying and then by heating.
 - (iv) If the heating coil surface temperature is 25°C , find the bypass factor. (16)

Or

- (b) Describe the construction and working of Ammonia-water vapour absorption refrigeration system. (16)
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