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**Question Paper Code : 31038**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fifth Semester

Mechanical Engineering

080120023 — THERMAL ENGINEERING

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the term Knocking.
2. What is meant by lean and rich mixture?
3. Why are two stroke engines not widely used in two wheelers?
4. What do you understand by Ignition delay?
5. Define critical pressure ratio for the steam nozzle.
6. Define diagram efficiency of a steam turbine.
7. What is the advantage of intercooler?
8. What is the effect of increase in clearance volume on ideal work of compression?
9. Define sensible heat factor.
10. What is meant by specific humidity?

PART B — (5 × 16 = 80 marks)

11. (a) (i) A diesel engine has a compression ratio of 14 to 1 and fuel is cut off at 0.08 of stroke. Calculate the mass of fuel used per kW hour, if the calorific value is 42000 kJ/kg and the relative efficiency is 0.54. (10)
- (ii) Show that the efficiency of the otto cycle is greater than diesel cycle for the same compression ratio. (6)

Or

- (b) (i) 1 kg of air is taken through a diesel cycle. Initially the air is at  $15^{\circ}\text{C}$  and 1 bar. The compression ratio is 15 and the heat added is 1850 kJ. Calculate the ideal cycle efficiency and the mean effective pressure. (10)
- (ii) Compare the actual and ideal PV diagrams of a four and two stroke engine. (6)
12. (a) (i) Explain the various factors that affect the flame speed in a SI engine. (6)
- (ii) List the various types of combustion chambers of a CI engine. Explain the principle of working of any one type of combustion chamber. (10)

Or

- (b) (i) Schematically explain the use of heat balance test of an engine. (6)
- (ii) A six cylinder, four stroke gasoline engine having a bore of 90 mm and stroke of 100 mm has a compression ratio 7. The relative efficiency is 55% when the indicated specific fuel consumption is 300 gm/kWh. Find the calorific value of the fuel and corresponding fuel consumption, given that the imep is 8.5 bar and speed is 2500 rpm. (10)
13. (a) Discuss the various methods of compounding and list their demerits. (16)

Or

- (b) A single stage steam turbine is supplied with steam at 10 bar and  $400^{\circ}\text{C}$  at 50 kg/s. It expands to a condenser pressure of 0.4 bar, the blade velocity is 8000 m/s. The nozzles are inclined at an angle of  $20^{\circ}$  to the plane of the wheel and the outlet blade angle is  $30^{\circ}$ . Neglecting the frictional losses determine the power developed, blade efficiency and the stage efficiency. (16)
14. (a) A single-stage single-acting air compressor delivers 0.6 kg of air per minute at 6 bar. The temperature and pressure at the end of suction stroke are  $30^{\circ}\text{C}$  and 1 bar. The bore and stroke of the compressor are 100 mm and 150 mm respectively. The clearance is 3% of the swept Find:  
(i) Volumetric efficiency of the compressor (ii) Power required if the mechanical efficiency is 85% and (iii) speed of the compressor.

Or

- (b) Write short notes on the following: (i) Screw compressor (ii) Vane type compressor.

15. (a) Explain the working of aqua-ammonia vapour absorption refrigerating system. (16)

Or

- (b) (i) Explain Humidification and dehumidification with diagram. (6)
- (ii) Air initially at  $10^{\circ}\text{C}$  DBT and 70% relative humidity is heated to  $22^{\circ}\text{C}$  DBT. With the help of psychometric chart, find the amount of heat added to air and the relative humidity of heated air for an air flow of  $40\text{ m}^3/\text{min}$ . Also determine the by-pass factor of the heating coil if its surface temperature is  $30^{\circ}\text{C}$ ? (10)
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