

(3 Hours)

[Total Marks: 80]

- NB:**
- 1) Question number **one** is compulsory
 - 2) Attempt any **three** questions from remaining questions
 - 3) Assume suitable data wherever necessary and state it clearly
 - 4) Figures to the right indicates maximum marks

- Q1** Attempt any five of the following (20)
- a) Compare abnormal combustion in SI and CI engines.
 - b) Sketch and explain actual port timing diagram for two stroke engine.
 - c) Give the reasons of black, blue and white colored smokes from exhaust of diesel engines.
 - d) Explain the effects of spark advancement and retardation on the engine performance.
 - e) Explain why turbo charged engines may have inferior values of power output and fuel consumption than naturally aspirated engines especially at low speed.
 - f) What are the components (at least four) of general diesel fuel injection system? State in brief function of each of them.
- Q2**
- a) Describe the requirements for spark plug (08)
 - b) During test on a diesel engine the power developed by the engine is used for driving a DC generator with output of 210 ampere at 200 volt. The efficiency of generator is 82%. The fuel of 42600 kJ/kg calorific value is supplied to the engine at 11.2 kg/hr. The air fuel ratio was 18:1. The exhaust gases were passed through a exhaust gas calorimeter for which the observations were as follows:
Water circulated through at 580 liters/hr, Temperature rise of water through calorimeter is equal to 36°C. Temperature of exhaust gases at exit from calorimeter is 98 °C. Ambient temperature is 20 °C.
Heat lost to jacket cooling water is 32% of the total heat supplied. If the specific heat of exhaust gases be 1.05 kJ/kg K, draw up the heat balance sheet on minute basis. (12)
- Q3**
- a) With neat sketch explain various types of fuel nozzles used in CI engine injection system (10)
 - b) A perfect gas at 1 bar and 290 K undergoes ideal diesel cycle. The maximum pressure of the cycle is 50 bar. The volume at the beginning of compression is 1m^3 and after constant pressure heating is 0.1m^3 . Determine the temperature at all salient points of the cycle and also find out the efficiency of the cycle. Take $\gamma = 1.4$ for the gas. (10)
- Q4**
- a) Compare air and water cooling systems (08)
 - b) A closed type injector has a nozzle orifice diameter of 0.9 mm and maximum cross sectional area of passage between needle cone and the seat is 1.75mm^2 . Coefficient of discharge for the orifice is 0.85 and for the passage is 0.8. The injection pressure is 175 bar and the average pressure of charge during injection is 25 bar, when the needle cone is fully lifted up. Calculate the volume rate of flow per second of fuel through the injector and the velocity of jet at that instant. Take density of fuel equal to 850kg/m^3 . (12)

- Q5 a) Explain in detail the various stages of combustion in S.I. engine.
b) What is turbo charging? Describe in brief the methods of turbo charging. (10)
- Q6 Write short note on (any four) (20)
- a) Effect of dissociation phenomenon on PV diagram of Otto cycle
 - b) Control of NO_x emission.
 - c) Alternate fuels in I.C. engines.
 - d) Stages of combustion in CI engine
 - e) Exhaust gas recirculation
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