

- Notes: 1. Question No. 1 is compulsory  
2. Solve any **THREE** from remaining **FIVE** 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)
- Explain in brief the effect of increase in engine speed on angles of valve timing diagram?
  - Describe the effect of engine speed on spark intensity of battery ignition system.
  - Explain concept of quality governing and quantity governing.
  - What are the functions of cooling and lubrication system in engine?
  - With neat sketch explain exhaust gas recirculation
  - What are the advantages of Wankel Engine?
- Q2 a) Write a note on essential properties of lubricants commonly used for engine lubrication. (8)
- b) A simple carburettor is designed to supply 6 kg of air and 0.45 kg of fuel per minute to the 4 stroke single cylinder petrol engine. The ambient air is at 1.013 bar and 300 K with specific heat at constant pressure of 1000 J/kgK. Calculate the throat diameter of the venturi when the velocity of air is limited to 92 m/s. Take fuel density = 740 kg/m<sup>3</sup> and velocity coefficient = 0.8. If the pressure drop near the fuel nozzle is 75% of that at the venturi, calculate fuel nozzle diameter. Take discharge coefficient for fuel nozzle equal to 0.6. (12)
- Q3 a) Compare supercharging and turbo charging on following factors: Drive, Control over exhaust, Special exhaust manifolds, Efficiency, Erosion and Injection timing modification (8)
- b) During a test on a diesel engine the power developed by the engine is 42 kW. The fuel of 42600 kJ/kg calorific value is supplied to the engine at 0.187 kg/min. The air-fuel ratio was 18:1. The exhaust gases were passed through an exhaust gas calorimeter for which the observations were as follows: Water is circulated at 580 litres / hr, temperature rise of water through calorimeter is 36°C and temperature of exhaust gases at exit from calorimeter is 98°C. Ambient temperature is 20°C. Heat lost to cooling water jacket is 32% of the total heat supplied. If the specific heat of exhaust gases be 1.05 kJ / kg K, calculate heat balance sheet on min and percentage basis. (12)
- Q4 a) With neat sketch explain stages of combustion in CI engine and state factors affecting ignition delay period. (10)
- b) Explain design principles for SI engine combustion chamber. (10)

- Q5 a) Compare detonation in SI and CI engine. (10)
- b) What are the requirements of ignition system? With neat sketch explain high voltage capacitive discharge ignition system. (10)
- Q6 a) The compression ratio of an engine working on an Otto cycle is 8. The initial condition of air is 1 bar and 373 K. The maximum pressure of the cycle is limited to 50 bar. Determine volume, pressure and temperature at all salient points of the cycle. Also find the ratio of heat rejected and heat supplied on the basis of one kg of air. (10)
- b) Write short notes on (Any two) (10)
- i) Octane and Cetane rating of fuels
  - ii) Variable compression ratio engine
  - iii) Difference between unit pump injector system and CRDi system
  - iv) Evaporative cooling system

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