

Roll No.

Total Pages : 04

BT-5/D-18

35034

I.C. ENGINE AND GAS TURBINE

ME-301-E

Time : Three Hours]

[Maximum Marks : 100

Note : There are eight questions in this paper. All questions carry 20 marks. Attempt *Five* questions in all, selecting at least *one* question from each Section.

Section A

1. (a) An oil engine works on Diesel cycle, the compression ratio being 15. The temperature at the start of compression is 17°C and 700 kJ of heat is supplied at constant pressure per kg of air and it attains a temperature of 417°C at the end of adiabatic expansion. Find the air-standard efficiency of the cycle. What would be the theoretical work done per kg of air. Take $C_v = 0.717$ kJ/kgK and $\gamma = 1.4$. 15
- (b) Write the various assumptions made in air-standard cycles. 5

2. A compression-ignition engine has a compression ratio of 10 and 2/3 of heat of combustion is librated at constant volume and the remainder at constant pressure. The pressure and temperature at the beginning are 1 bar and 27°C and the maximum pressure is 40 bar. Find the temperatures at the end of compression and expansion, if it follows the law $pV^{1.35} = \text{constant}$ and $\gamma = 1.4$.

20

Section B

3. (a) Write a technical note on types of ignition systems, ignition timing and spark plugs. 12
- (b) Define knocking in CI engines. Also explain in detail Cetane rating and CI combustion chambers. 8
4. (a) Explain in detail Ignition limits, stages of combustion in SI engines, ignition lag and velocity of flame propagation. 12
- (b) What is pre-ignition in IC engines ? Also discuss delay period and the variables affecting delay period. 8

Section C

5. The following observations were made during a test on a single cylinder four stroke oil engine :

Displacement volume = 3 litre; speed of the engine = 600 rpm; fuel consumption = 2.9 kg/h; calorific value of fuel = 42,500 kJ/kg; difference in tension on either side of the brake pulley = 450 N; arm length = 0.35 m; length of indicator diagram = 60 mm; area of positive loop of indicator diagram = 580 mm²; area of negative loop = 30 mm²; spring constant = 0.85 bar per mm. Calculate :

- (a) bp
- (b) ip
- (c) Mechanical efficiency
- (d) brake thermal efficiency
- (e) bsfc.

20

6. (a) Write the various functions of lubricating system. Also discuss in detail types of lubricating system. <http://www.kuonline.in>
- (b) What is the necessity of engine cooling ? Write the various disadvantages of overcooling. Also discuss in detail air cooling, water cooling and radiators.

12

Section D

7. (a) Write a technical note on the current scenario on the pollution front. Also discuss various methods of emission control. 12
- (b) Describe working of a two stage compressor with intercooling. Also write the advantages of multi-stage expansion with reheating between stages. 8
1. (a) Discuss in detail Brayton cycle. Also write the various components of a gas turbine plant. 12
- (b) With neat sketch, Explain the multistage compression with intercooling with regards to gas turbine plant. 8