

6. (a) Explain with sketches piston and cylinder temperature distribution. (10)
- (b) Why Morse test is not suitable for single cylinder engine? Describe the method of finding friction power using Morse test. (5)

7. What are catalytic converters? Discuss the role of catalytic converter in reducing pollution. Also discuss how do they help in reducing HC, CO and NO<sub>x</sub> emissions? (15)

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Total Pages : 4

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B.Tech. (ME) VI SEMESTER

Internal Combustion Engines (PEC-ME-304)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
2. Answer any four questions from Part-B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.
4. Use of scientific calculator is allowed.

### PART-A

1. (a) What is meant by mean piston speed? Explain its importance. (1.5)
- (b) What is the use of air-standard cycle analysis? (1.5)
- (c) How does exhaust temperature and mean effective pressure affect the engine performance? Explain. (1.5)
- (d) Define volumetric efficiency and discuss the effect of various factors affecting the volumetric efficiency. (1.5)

- (e) Explain why a rich mixture is required for idling. (1.5)
- (f) Why high fuel pressure is required in modern injection systems? (1.5)
- (g) What is delay period and what are the factors that affect it? (1.5)
- (h) What are the limitations of liquid cooling system? (1.5)
- (i) What is crankcase blowby? How it is controlled? (1.5)
- (j) Explain the sensors used for temperature measurements. (1.5)

### PART-B

2. (a) An one-litre cubic capacity, four-stroke, four-cylinder SI engine has a brake thermal efficiency of 30% and indicated power is 40 kW at full load. At half load, it has a mechanical efficiency of 65%. Assuming constant mechanical losses, calculate :
- brake power.
  - frictional power.
  - mechanical efficiency at full load.
  - indicated thermal efficiency.
- If the volume decreases by eight-fold during the compression stroke, calculate the clearance volume. (10)

- (b) Show that the efficiency of the Diesel cycle is lower than that of Otto cycle for the same compression ratio. Comment why the higher efficiency of the Otto cycle compared to Diesel cycle for the same compression ratio is only of academic interest and not practical importance. (5)

3. (a) What is meant by ignition? What is the interrelation between ignition and combustion? What are various types of ignition system that are commonly used? (5)
- (b) In a S.I. engine working on the ideal Otto cycle, the compression ratio is 5.5. The pressure and temperature at the beginning of compression are 1 bar and 27°C respectively. The peak pressure is 30 bar. Determine the pressure and temperatures at the salient points, the air-standard efficiency and the mean effective pressure. Assume ratio of specific heats to be 1.4 for air. (10)

4. What is meant by supercharging and turbocharging? Discuss their benefits and limitations with suitable data and diagrams. Also discuss the importance of turbocharging on the GDI engines. (15)

5. What are the various components to be lubricated in an engine and explain how it is accomplished? Insert suitable diagrams wherever required. (15)