

[This question paper contains 4 printed pages.]

Your Roll No.

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MEM

Paper—ME.601

I. C. ENGINES

Time : 3 Hours

Maximum Marks : 100

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Answer any five questions.

Assume missing data, if any.

1. (a) Describe sequence of processes which must occur from start of injection to the end of combustion in a diesel engine. 12
- (b) "The factors that promote knock in CI engines, reduce knock in SI engines." Comment this statement. 8
2. (a) Define and explain the term ignition delay in SI engines. Explain the effect of the following variables on ignition delay in SI engines :
(i) intake air temperature, (ii) equivalence ratio,
(iii) engine speed, (iv) residual gas fraction. 10
- (b) Define the following terms :
(i) Knock in SI engines, (ii) Octane number,
(iii) Sensitivity of SI engine fuels. 6

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- (c) Explain how flame velocity and thermal efficiency varies with turbulence in SI engines. 4
3. (a) Briefly describe the following properties of engine oil :
- (i) viscosity index, (ii) flash point and fire points. 6
- (b) With the help of a neat sketch, explain how high speed engines are lubricated using pressure-fed wet lubrication system. 7
- (c) Describe common rail fuel-injection system for modern diesel engines. 7
4. (a) Explain why rich mixture is required not only during cold start and idling but also during full load operation in SI engines. 6
- (b) "In SI engines maximum power and minimum fuel consumption depends on air-fuel ratio." Explain the mixture requirements for various power outputs and variable brake specific fuel consumption. 8
- (c) "Power of a diesel engine is limited by smoke." Justify the statement with regards to air-fuel ratio. 6
5. (a) Define and explain scavenging process of two-stroke engines. Also explain the following terms :
- (i) Perfect scavenging
- (ii) Perfect mixing
- (iii) Short circuiting 8

- (b) What are the basic requirements of a good SI engine combustion chamber ? How these can be achieved ? Briefly explain the design principles of a good combustion chamber of a SI engine. 12
6. (a) What are the basic requirements of ideal gasoline ? Draw distillation curve of gasoline and explain the significance of various points on the curve which affects engine performance emissions and fuel economy characteristics. 10
- (b) Explain how compressed natural gas (CNG) can be used in SI engines in dual fuel mode. 5
- (c) Compare exhaust emissions of CO, HC and NO_x of gasoline and CNG fueled SI engines. 5
7. (a) What are the supercharging limits of SI and CI engines ? What are the modifications required for supercharging of CI engines. 5
- (b) A four-stroke 2.8 litre CI engine develops 12.5 kW per m³ of free air inducted per minute when run at 3000 rpm. The engine has volumetric efficiency of 85% at the intake temperature of pressure of 1.013 bar. The engine is mechanically using a blower of isentropic efficiency of 74% and works through a pressure ratio of 2. Calculate volumetric efficiency of the engine and increase in power.

Assume all mechanical efficiencies to be 78%, take that the end of induction of cylinders contains a volume of charge equal to the swept volume at the pressure and temperature of the delivery from the blower. 15

8. Write short notes on the following : 10 + 10

- (i) Free piston engine.
- (ii) Honda CVCC engine.