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Printed Page:-4 **Subject Code:- BME0514**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: V - THEORY EXAMINATION (2025 - 2026)
Subject: Automotive Engines

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*
1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*
2. *Maximum marks for each question are indicated on right -hand side of each question.*
3. *Illustrate your answers with neat sketches wherever necessary.*
4. *Assume suitable data if necessary.*
5. *Preferably, write the answers in sequential order.*
6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. The cycle used in a petrol engine is: CO1,K1 1

(a) Otto cycle
(b) Diesel cycle
(c) Carnot cycle
(d) Dual cycle

1-b. Which is a primary function of engine cooling system? CO1,K1 1

(a) Maintain engine temperature within safe limits
(b) Increase engine displacement
(c) Delay ignition
(d) Improve spark plug life only

1-c. Dry sump lubrication differs from wet sump by: CO2 ,K1 1

(a) Using an external reservoir and scavenge pumps
(b) Having no oil at all
(c) Using fuel as lubricant
(d) Using more piston rings

1-d. Detonation in SI engines is usually due to: CO2,K1 1

(a) Rapid pressure rise from uncontrolled autoignition of fuel droplets
(b) Spark plug misfire
(c) Carburetor blockage
(d) Lubrication failure

1-e. In the fuel injection system, the CRDI stands for: CO3,K1 1

(a) Common Rail Direct Injection
(b) Common Rotary Diesel Injection
(c) Combined Rail Diesel Injection
(d) Combined Rail Direct Injection

1-f. The main function of the governor in an engine is to: CO3,K1 1

(a) Regulate air-fuel ratio
(b) Maintain constant speed
(c) Regulate exhaust gases
(d) Control fuel injection timing

1-g. Retarding ignition timing generally: CO4,K1 1

(a) Reduces knock but lowers power and efficiency
(b) Increases knock and power
(c) Improves cooling drastically
(d) Has no effect

1-h. A direct injection (DI) diesel combustion chamber has the injector: CO4,K1 1

(a) Directly in the combustion chamber
(b) In a pre-chamber separate from cylinder
(c) In the intake manifold
(d) Outside the engine block

1-i. Effect of supercharging on engine performance is: CO5,K1 1

(a) Increased power and torque but higher thermal loads
(b) Lowered torque always
(c) Reduced fuel consumption always
(d) No change in volumetric efficiency

1-j. An intercooler after a turbocharger: CO5,K1 1

(a) Reduces charge air temperature and increases density
(b) Removes oil from intake
(c) Increases exhaust back pressure
(d) Preheats intake air

2. Attempt all parts:-

2.a. State the significance of firing order. CO1,K2 2

2.b. Write two advantages of electronic ignition system. CO2,K2 2

2.c. Write two differences between direct and indirect injection. CO3,K2 2

2.d. Explain function of intercooler. CO4,K2 2

2.e. What is BMEP and its significance? CO5,K2 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i) Compare SI and CI engines with at least six points. CO1,K2 6

3.a.(ii) Explain the function of piston rings, connecting rod, and crankshaft. CO1,K1 6

3.b. Answer any one of the following:-

3.b.(i)	Explain the working of a mechanical governor. CO2, K2	6
3.b.(ii)	Explain the working principle of a battery ignition system. CO2,K2	6

3.c. Answer any one of the following:-

3.c.(i)	Explain abnormal combustion and its effects in SI engines. CO3,K2	6
3.c.(ii)	Explain the burned and unburned mixture states during combustion. CO3,K2	6

3.d. Answer any one of the following:-

3.d.(i)	Compare air and liquid cooling systems with advantages and disadvantages. CO4,K3	6
3.d.(ii)	Discuss different types of lubrication systems in engines. CO4,K3	6

3.e. Answer any one of the following:-

3.e.(i)	Explain how thermal efficiency is calculated from test data. CO5,K3	6
3.e.(ii)	Compare brake thermal efficiency and indicated thermal efficiency. CO5,K2	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	With neat diagrams, explain the working of a four-stroke diesel engine. CO1,K3	10
4-b.	Explain the stages of combustion in SI engine with suitable diagrams. CO1,K3	10

5. Answer any one of the following:-

5-a.	Explain gasoline direct injection (GDI) in detail and evaluate its advantages over port fuel injection. CO2,K3	10
5-b.	Discuss the significance of injection lag in CI engines and methods to minimize it. CO2,K3	10

6. Answer any one of the following:-

6-a.	With sketches, discuss combustion chamber design objectives in SI engines. CO3,K3	10
6-b.	With diagrams, explain indirect injection combustion chambers and their performance. CO3,K3	10

7. Answer any one of the following:-

7-a.	Explain necessity of supercharging and its effect on performance and efficiency. CO4,K3	10
7-b.	Explain working of turbocharger system and its effect on engine efficiency. CO4,K3	10

8. Answer any one of the following:-

8-a.	The following data were recorded from a test on a single cylinder four-stroke oil engine. Cylinder bore = 150 mm, engine stroke = 250 mm, area of indicator diagram = 450 mm², length of indicator diagram = 50 mm, indicator spring rating = 1.2 mm, engine speed = 420 rpm, brake torque = 217 Nm, consumption = 2.95 kg/h, calorific value of fuel = 44000 kJ/kg, cooling water rate of flow = 0.068 kg/s, cooling water temperature rise = 45 K, specific heat capacity of the cooling water = 4.1868 kJ/kg K. Calculate	10

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(a) The mechanical efficiency
(b) The brake thermal efficiency,
(c) The specific fuel consumption, and
(d) Draw up an energy balance in kW CO5,K4

8-b. A 4-cylinder petrol engine operates on the four-stroke cycle. The bore of each cylinder 80mm and the stroke 120mm. The clearance volume per cylinder is 68cm^3. At a speed of 4000 RPM the fuel consumption is 20kg/h and the torque developed is 150N-m. 10

Calculate: (Assume any missing data)
(a) The brake power,
(b) The brake mean effective pressure
(c) The brake thermal efficiency CO5,K4