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Printed Page:-3 **Subject Code:- AMTME0118**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
M.Tech
SEM: I - THEORY EXAMINATION (2025 - 2026)
Subject: Advanced l.C. Engines

Time: 3 Hours **Max. Marks: 70**

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 15

1. Attempt all parts:-

1-a. In an internal combustion engine, the process of removing the burnt gases from the combustion chamber of the engine cylinder is known as (CO1, K1) 1

(a) Scavenging
(b) Detonation
(c) Supercharging
(d) Polymerisation

1-b. In compression ignition engines, swirl denotes a ……..(CO2, K1) 1

(a) Haphazard motion of the gases in the chamber
(b) Rotary motion of the gases in the chamber
(c) Radial motion of the gases in the chamber
(d) None of the above

1-c. Number of working strokes per min. for a four stroke cycle engine are _____ the speed of the engine in r.p.m. (CO3, K1) 1

(a) Equal to
(b) One-half
(c) Twice
(d) Four-times

1-d. The ratio of indicated thermal efficiency to the corresponding air standard cycle efficiency is called... (CO4, K1) 1

(a) Net efficiency
(b) Efficiency ratio
(c) Relative efficiency

(d) Overall efficiency

1-e. Which of the following has the same combustion as HCCI (Homogeneous Charge Compression Ignition) engine? (CO5, K1) 1

(a) SI engine
(b) CI engine
(c) Hybrid of both SI and CI engine
(d) Wankel engine

2. Attempt all parts:-

2.a. How will you differentiate between two stroke engine and four stroke engines? (CO1, K2) 2

2.b. What are the advantages and disadvantages of open combustion chamber type? (CO2, K2) 2

2.c. How do you find the indicated power in an IC engine? (CO3, K2) 2

2.d. Can alcohol be used for CI engines? Explain. (CO4, K2) 2

2.e. What are the disadvantages of the hydrogen fuels? (CO5, K2) 2

SECTION-B 20

3. Attempt all parts:-

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

3.a.(i) Explain with the help of P-V diagram, how the actual cycle differs from theoretical cycle in S.I. engine? (CO1, K2) 4

3.a.(ii) The compression ratio of diesel cycle is 13. Determine the percent decrease in efficiency of the cycle when cut-off changes from 5% to 15% of the stroke. (CO1, K3) 4

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

3.b.(i) Mention the factors to be considered for the design of combustion chambers of C.I. engine. (CO2, K2) 4

3.b.(ii) Explain that the requirement of air motion and swirl in CI engine combustion chamber is much more stringent that in an SI Engine. (CO2, K2) 4

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

3.c.(i) Write the difference between turbocharging and mechanical supercharging? (CO3, K2) 4

3.c.(ii) A 4- cylinder 4- stroke petrol engine develops 14.7 kW at 1000 rpm. The mean effective pressure is 5.5 bar. Calculate the bore and stroke of the engine, if the length of stroke is 1.5 times of the bore. (CO3, K3) 4

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

3.d.(i) What is cold starting in Diesel engine? Explain various cold starting aid with neat sketch. (CO4, K2) 4

3.d.(ii) What are catalytic converters? How are they helpful in reducing HC, CO and NOx emissions? (CO4, K2) 4

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

3.e.(i) Illustrate dual cycle with operation and neat sketch. (CO5, K3) 4

3.e.(ii) Differentiate between parallel and series hybrid trains. (CO5, K4) 4

SECTION-C 35

4. Answer any one of the following:-

4-a.	In an IC Engine working on ideal Otto cycle, the air at 1 bar 290 K is compressed adiabatically to 15 bar. On adding heat, this pressure rises to 40 bar. Calculate: (i) air standard efficiency (ii) mean effective pressure for the cycle Take R = 8.314 kJ/kmol K and C_v = 0.718 kJ/ kg K. (CO1, K3)	7
4-b.	What is the basic difference between Otto cycle & Diesel cycle? Deduce the expression of thermal efficiency for Diesel cycle. (CO1, K3)	7

5. Answer any one of the following:-

5-a.	Discuss the variables affecting delay period in CI engines, in detail. Justify your answer with reason. (CO2, K2)	7
5-b.	Using a Pressure - Crank angle diagram explain the desirable combustion for an SI engine & the effect of autoignition leading the abnormal combustion. Also explain the undesirable effects to the auto ignition on engines? (CO2, K3)	7

6. Answer any one of the following:-

6-a.	Describe the working of a constant pressure turbocharging in C.I. engine. Write its merits and demerits? (CO3, K2)	7
6-b.	Explain the performance combustion and emission characteristics of CI engine used Bio diesel as a fuel? (CO3, K2)	7

7. Answer any one of the following:-

7-a.	What are the major sources of air pollutants? Describe all the pollutants that are emitted by I. C. engines? (CO4, K2)	7
7-b.	What are the various types of instruments used for the measurement of emission from IC engines? With a schematic diagram, describe in detail the chemiluminescence method of measuring oxides of nitrogen. (CO4, K2)	7

8. Answer any one of the following:-

8-a.	Describe the working and architecture of Electric vehicle with suitable sketch diagram. (CO5, K2)	7
8-b.	Describe the constructional features of stratified charged injection with a neat sketch. (CO5, K2)	7