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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute)

Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow

M.Tech

SEM: I - THEORY EXAMINATION (2021 - 2022)

Subject: Advanced I.C. Engines

Time: 03:00 Hours Max. Marks: 70

General Instructions:

1. All questions are compulsory. It comprises three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 4 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 7 marks each.
- 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 The mean effective pressure obtained from engine indicator indicates the….. (CO1) 1

1. Maximum pressure developed
2. Minimum pressure
3. Instantaneous pressure at any instant
4. Average pressure

1 The knocking in spark ignition engines can be reduced by ….. (CO2) 1

1. Retarding the spark
2. Increasing the engine speed
3. Both are correct
4. None of these

1 Supercharging is the process of …….. (CO3) 1

1. Supplying the intake of an engine with air at a density greater than the density of the surrounding atmosphere
2. Providing forced cooling air
3. Injecting excess fuel for raising more loads
4. Supplying compressed air to remove combustion products fully

1 Pollutants are produced by the incomplete burning of the air-fuel mixture in the combustion chamber. (CO4) 1

1. TRUE
2. FALSE

1 Which of the following is true for the HCCI engine? (CO5) 1

1. Emits high NOx and soot
2. Have a large power range
3. Efficiency is comparatively less
4. Pre-catalyst hydrocarbon emissions are higher

2. Attempt all parts:-

2 Why have four cylinders in an engine? Why not have one big cylinder of the same displacement of the four cylinders instead? (CO1) 2

2	What is equivalence ratio? (CO2)	2
2	If BSFC of S.I. engine is 0.25 kg/kWh and the C.V. of fuel used is 45000kJ/kg, what is the overall efficiency of the engine? (CO3)	2
2	List out the drawbacks of catalytic converters. (CO4)	2
2	Do turbos increase horsepower? (CO5)	2

SECTION B 20

3. Answer any five of the following:-

3	What factors influence in computer modeling of engine cycle analysis? (CO1)	4
3	Find the percentage loss in ideal efficiency of a Diesel engine with compression ratio 15, by delaying the fuel cut-off from 5% to 8% of the stroke. (CO1)	4
3	Mention the factors to be considered for the design of combustion chambers of C.I. engine. (CO2)	4
3	Explain the type of vibration produced when auto ignition occurs. (CO2)	4
3	What is supercharging? Discuss main object lines of supercharging? (CO3)	4
3	What are the effects of unburnt hydrocarbons on environment and human health? (CO4)	4
3	How does efficiency can be increased in jet engine? (CO5)	4

SECTION C 35

4. Answer any one of the following:-

4	Define the mean effective pressure. An engine of 250 mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.00263 m^3. The initial Pressure and temperature are 50^0 C and 1 bar respectively. If the maximum pressure is limited to 25 bar, find: (i). the air-standard efficiency of the cycle (ii). the mean effective pressure for cycle. (iii). Work done (iv). Temperature and pressure at all salient points of the cycle Assume: $\gamma = 1.4$ and Cv = 0.718 kJ/kg-K, Cp = 1.005 kJ/kg-K. (CO1)	7
4	The airflow to a four-cylinder, four-stroke oil engine is measured by a 5 cm diameter orifice having a coefficient of discharge of 0.6. The engine having bore 10 cm and stroke 12 cm runs at 1200 r.p.m. Pressure drop across orifice is 4.6 cm of water and, ambient temperature and, pressure are 17^0C and 1 bar respectively. calculate the volumetric efficiency based on free air condition. (CO1)	7

5. Answer any one of the following:-

5	Enlist the methods of controlling diesel knock. Discuss any three of them.(CO2)	7
5	Discuss the variables affecting delay period in CI engines, in detail. Justify your answer with reason. (CO2)	7

6. Answer any one of the following:-

6	Explain pressure feed type wet sump lubrication system with neat sketch. (CO3)	7
6	A 4-cylinder 2-stroke cycle petrol engine develops 30 kW at 2500 rpm. The mean effective pressure on each piston is 18 bar and mechanical efficiency is 18%. Calculate the (i) diameter and stroke of each cylinder having stroke to bore ratio of 1.5. (ii) fuel consumption of the engine, if brake thermal efficiency is 28%. The calorific valve of the fuel is 43900 kJ/kg. (CO3)	7

7. Answer any one of the following:-

7	How the oil consumption increases in IC engines and what are the effects? (CO4)	7
7	Given a detailed comparison between alcohols, vegetables oils, vegetables oil-based bio diesel as their suitability for use in SI and CI engine? (CO4)	7

8. Answer any one of the following:-

8	Elaborate Gas Propulsion System with a diagram? (CO5)	7
8	Define exhaust energy recovery systems.(CO5)	7