Printed Page:-04 Subject Code:- AME0511 Roll. No: NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA (An Autonomous Institute Affiliated to AKTU, Lucknow) **B.Tech** SEM: V - THEORY EXAMINATION (2024-2025) Subject: Internal Combustion Engine 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. 20 **SECTION-A** 1. Attempt all parts:-1-a. Engines of different cylinder dimensions, power and speed are compared on the 1 basis of (CO1, K1) maximum pressure (a) fuel consumption (b) mean effective pressure (c) unit power (d)

- 1-b. Thermal efficiency of CI engine is higher than that of SI engine due to (CO1, K1) 1
 - (a) fuel used
 - (b) higher compression ratio
 - (c) constant pressure heat addition
 - (d) none of the above
- 1-c. The actual efficiency of a good engine is about----- of the estimated fuelair cycle efficiency. (CO2, K1)
 - (a) 1
 - (b) 0.85
 - (c) 0.5
 - (d) 0.25
- 1-d. Mean effective pressure at a given compression ratio is maximum when the airfuel ratio is (CO2, K1)

- (a) higher than stoichiometric
- (b) lower than stoichiometric
- (c) equal to stoichiometric
- (d) none of the above

1-e.

- (a) decreases
- (b) increases
- (c) not affected
- (d) none of the above
- 1-f. Open combustion chambers in CI engines require (CO3, K1)
 - (a) high injection pressures
 - (b) accurate metering of fuel by the injection system
 - (c) both (a) and (b)
 - (d) none of the above
- 1-g. Most commonly used lubrication system in automobiles is the (CO4, K1)

JEC-2024

Increasing the compression ratio in SI engines the knocking tendency (CO3, K1)

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- (a) splash system
- (b) pressure system
- (c) petrol system
- (d) gravity system
- 1-h. Radiator is provided to (CO4, K1)
 - (a) cool the jacket water
 - (b) pressurise the cooling water
 - (c) provide additional water flow
 - (d) none of the above
- 1-i. Variable compression ratio can be used in (CO5, K1)
 - (a) S I engine
 - (b) C I engine
 - (c) Wankel engine
 - (d) All of the above
- 1-j. HCCI engines (CO5, K1)
 - (a) emits high NOx and soot
 - (b) have large power range
 - (c) efficiency is comparatively less
 - (d) pre-catalyst hydrocarbon emissions are higher.

2. Attempt all parts:-

- 2.a. Define (i) brake thermal efficiency (ii) volumetric efficiency (CO1, K1)
- 2.b. What do you mean by stoichiometric air fuel (A/F) ratio? (CO2, K1)

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2.c.	Factors that tend to reduce detonation in S.I. engine increase knocking in the C.I. engine. Justify your answer. (CO3, K2)	2
2.d.	Why air-cooled engines are noisy than liquid cooled engines. (CO4, K2)	2
2.e.	List the parameters by which performance of an engine is evaluated. (CO5, K2)	2
SECTION	<u>DN-B</u>	30
3. Answ	er any <u>five</u> of the following:-	
3-a.	Find the brake thermal efficiency of an engine which consumes 7 kg of fuel in 20 minutes and develops a brake power of 65 kW. The fuel has a heating value of 42000 kJ/kg. (CO1, K4)	6
3-b.	What is dissociation ? How does it affect power developed by the engine? (CO1, K2)	6
3-с.	Explain the effect of fuel viscosity on diesel engine performance. (CO2, K2)	6
3-d.	What is the effect of high sulphur content on the performance of SI and CI engines? (CO2, K2)	6
3.e.	What is delay period and what are the factors that affect it? (CO3, K1)	6
3.f.	What do you understand by "crankcase ventilation"? (CO4, K1)	6
3.g.	A four cylinder engine running at 1200 rpm delivers 20 kW. The average torque when one cylinder was cut is 110 Nm. Find the indicated thermal efficiency if the calorific value of the fuel is 43 MJ/kg and the engine uses 360 grams of gasoline per kW h. (CO5, K4)	6
SECTION	SECTION-C	
4. Answ	er any <u>one</u> of the following:-	
4-a.	Derive an expression for the efficiency of Otto cycle and comment on the effect of compression ratio on the efficiency with respect of ratio of specific heats by means of a suitable graph. (CO1, K1)	10
4-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 a academic interest and not practical importance. (CO1, K4)	10
5. Answ	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 a academic interest and not practical importance. (CO1, K4) er any <u>one</u> of the following:-	10
5. Answ 5-a.	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 a academic interest and not practical importance. (CO1, K4) er any <u>one</u> of the following:- State the advantages and disadvantages of hydrogen as I.C. engine fuel. (CO2, K2)	10
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7-a.Explain the two types of cooling systems and compare them. (CO4, K2)10

10

7-b. Explain briefly the following : (i) Film lubrication (ii) Elasto-hydrodynamic lubrication (iii) Boundary lubrication. (CO4, K2)

8. Answer any one of the following:-

- 8-a. A four-stroke gas engine having a cylinder of 250 mm diameter and stroke 450 10 mm has a volumetric efficiency of 80%, ratio of air to gas is 8 to 1, calorific value of gas is 20 MJ/m³ at NTP. Find the heat supplied to the engine per working cycle. If the compression ratio is 5, what is the heating value of the mixture per working stroke per m³ of total cylinder volume? (CO5, K4)
- 8-b. What are the factors that affect the power output of an engine? Explain how 10 supercharging helps to improve the power output. (CO5, K2)

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