

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular/Supplementary Winter Examination – 2024

Course: B.Tech **Branch : Mechanical Engineering/Mechanical Engineering Sandwich**

Subject Code & Name: BTMPE703D Advanced IC Engines **Semester : VII**

Max Marks: 60 **Date:10/02/2025** **Duration: 3 Hr.**

Instructions to the Students:

1. Each question carries 12 marks.
2. Question No. 1 will be compulsory and include objective-type questions.
3. Candidates are required to attempt any four questions from Question No. 2 to Question No. 6.
4. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
5. Use of non-programmable scientific calculators is allowed.
6. Assume suitable data wherever necessary and mention it clearly.

		(Level/CO)	Marks
Q. 1	Objective type questions. (Compulsory Question)		12
1	Which of the following components is part of the air-fuel supply system in IC engines? a Exhaust valve b. Carburetor or Fuel Injectors c. Piston d. Crankshaft	CO1	1
2	Compression Ignition engines primarily operate on: a. High compression ratios b. Spark plugs c. Low compression ratios d. None	CO1	1
3	The air-fuel ratio in Spark Ignition engines is typically: a. Rich b. Lean c. Stoichiometric d. None	CO1	1
4	Normal combustion in an engine is characterized by: a. Rapid, smooth pressure rise b. Explosive pressure rise c. Slow combustion d. No pressure rise	CO2	1
5	Which of these is considered abnormal combustion in an engine? a. Detonation b. Smooth power output c. High fuel efficiency d. Low engine noise	CO2	1
6	The spark timing is adjusted to: a. Control the speed of combustion b. Decrease compression c. Increase engine power output d. Control exhaust temperature	CO2	1

7	Which emission is most harmful to human health and is a key contributor to air pollution?				CO3	1
	a. Carbon dioxide	b. Nitrogen oxides	c. Carbon monoxide	d. Sulfur dioxide		
8	In order to control HC (hydrocarbon) emissions, an engine can use a:				CO3	1
	a. Air-fuel mixture sensor	b. EGR system	c. Catalytic converter	d. Crankshaft		
9	Which alternative fuel has the potential to significantly reduce NOx emissions in CI engines?				CO4	1
	a. Biodiesel	b. Hydrogen	c. Methanol	d. Natural gas		
10	Which alternative fuel is typically used in spark ignition (SI) engines?				CO4	1
	a. Biodiesel	b. Hydrogen	c. CNG	d. Methanol		
11	What does CRDI stand for?				CO5	1
	a. Common Rail Diesel Injection	b. Combined Rail Diesel Injection	c. Constant Rail Direct Injection	d. Common Range Direct Injection		
12	HCCI engines can achieve:				CO5	1
	a. Higher NOx emissions	b. Reduced fuel efficiency	c. Lower CO and particulate emissions	d. Increased engine knocking		
Q. 2 Solve the following.						12
A)	Describe the different fuel injection systems in SI engines. Discuss the advantages and disadvantages of monopoint, multipoint, and direct injection systems?				CO1	6
B)	Describe the working of a Compression Ignition (CI) engine. How does it differ from the SI engine in terms of operation and fuel characteristics?				CO1	6
Q.3 Solve the following.						12
A)	What is pre-ignition? How does it affect the performance of an engine?				CO2	6

B)	Explain the difference between normal and abnormal combustion in an internal combustion engine.	CO2	6
Q. 4 Solve Any Two of the following.			12
A)	What are the main pollutants emitted from internal combustion engines? Explain their formation in the combustion process.	CO3	6
B)	How do diesel particulate filters (DPF) work to reduce particulate emissions in diesel engines?	CO3	6
C)	What are the different types of emission testing cycles (e.g., FTP-75, NEDC)? How are they used to measure vehicle emissions?	CO3	6
Q.5 Solve Any Two of the following.			12
A)	What are the emission benefits of using LPG as a fuel in IC engines compared to gasoline?	CO4	6
B)	What are the environmental benefits of using alternative fuels such as hydrogen, CNG, and biofuels in IC engines?	CO4	6
C)	What modifications are necessary for an engine to operate on biodiesel fuel?	CO4	6
Q. 6 Solve Any Two of the following.			12
A)	What is Homogeneous Charge Compression Ignition (HCCI)? Explain its working principle and its advantages over conventional combustion methods?	CO5	6
B)	Discuss the concept of Common Rail Direct Injection (CRDI) and how it enhances the performance of CI engines.	CO5	6
C)	What are the challenges in controlling combustion in HCCI engines, and how can they be overcome?	CO5	6
*** End ***			