Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, May 2025

Course: Internal Combustion Engines | **Semester : IV**

Program: B. Tech- Automotive Engineering | **Time : 03 hrs.**

Course Code: MEAD2015 | **Max. Marks: 100**

Instructions: Use standard notations for explanation. Assume suitable data.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	How are SI engine fuels rated? What is the significance of the fuel rating?	**4**	**CO1**
Q 2	Draw a suitable diagram to explain the variation of air: fuel for varying loading condition.	**4**	**CO1**
Q 3	Can supercharging reduce the specific fuel consumption? Under what conditions is this possible?	**4**	**CO1**
Q 4	Discuss the factors that enable CI Engines to handle supercharging better than SI engines.	**4**	**CO2**
Q 5	An engine has high indicated power but low brake power—what are some advanced-level reasons beyond friction?	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

S. No.		Marks	CO
Q 6	In an ideal Diesel cycle, the pressure and temperature are 1.03 bar and 27 ◦C respectively. The maximum pressure in the cycle is 47 bar and the heat supplied during the cycle is 545 kJ/kg. Determine (i) the compression ratio (ii) the temperature at the end of compression (iii) the temperature at the end of constant pressure combustion and (iv) the air-standard efficiency. Assume γ= 1.4 and Cp = 1.004 kJ/kg K for air.	**10**	**CO3**
Q 7	A single-jet carburettor is supplying a mixture to an SI engine. The following data is given: Throat diameter of the venturi = 20 mm, Air enters at a pressure of 1 bar and a temperature of 300 K, Air velocity at throat = 100 m/s, Fuel is injected through a jet with an area of 1 mm^2, Density of fuel = 750 kg/m^3, Coefficient of discharge for fuel jet = 0.7, Pressure at the throat = 0.95 bar.	**10**	**CO3**

Q 8	Discuss in detail the stages of combustion in a CI engine. How does ignition delay affect each stage? Also, explain how injection parameters can be optimized to control delay.	**10**	**CO2**
Q 9	Discuss the principle of supercharging an engine. What are different supercharging methods used in diesel engines? **OR** In a four-stroke engine, why is power output not exactly half that of a two-stroke engine, despite firing every alternate cycle?	**10**	**CO2**
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	A two stroke diesel engine having friction power of 1.5 kW is tested for one hour and the following observations were recorded: Brake torque = 120 Nm; Speed = 600 rpm; Fuel used = 2.5 kg; calorific value of fuel = 40.3 MJ/kg; Cooling water used = 818 kg; Rise in temperature of cooling water = 10°C. Exhaust gas temperature = 345°C. Room temperature = 25°C; A/F = 32 : 1. Determine : (i) BP & IP (ii) Mechanical efficiency, (iii) Indicated thermal efficiency (iv) Draw heat balance sheet on minute basis and in percentage.	**20**	**CO4**
Q 11	An engine working on Otto cycle has a volume of 0.45 m^3, pressure 1 bar and temperature 30 °C at the beginning of compression stroke. At the end of compression stroke, the pressure is 11 bar. 210 kJ of heat is added at constant volume. Determine : (i) Pressures, temperatures and volumes at salient points in the cycle. (ii) Efficiency. (iii) Net work per cycle. (iv) Mean effective pressure. (v) Ideal power developed by engine if working cycles per minute is 210. **OR** An eight-cylinder, four-stroke engine of 9 cm bore and 8 cm stroke with a compression ratio of 7 is tested at 4500 rpm on a dynamometer which has 54 cm arm. During a 10 minutes test the dynamometer scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44000 kJ/kg. Air 27 °C and 1 bar was supplied to the carburettor at the rate of 6 kg/min. Find (i) the brake power delivered (ii) the brake mean effective pressure (iii) the brake specific fuel consumption (iv) the brake specific air consumption (v) the brake thermal efficiency (vi) the volumetric efficiency and (vii) A:F	**20**	**CO3**