Name: **Enrolment No:**	

UPES

End Semester Examination, December 2023

Course: IC Engines **Semester: VII**

Program: B. Tech. Mechanical Engineering **Time : 03 hrs.**

Course Code: MEAD4021P **Max. Marks: 100**

Instructions: Assume any missing data.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Discuss the major factors affecting the ignition lag in an engine.	**4**	**CO1**
Q 2	Explain the process the determine the friction power of an engine using Willian line test.	**4**	**CO2**
Q 3	"Turbo lag is experienced at lower rpm and not at higher", comment on the statement.	**4**	**CO1**
Q 4	Discuss the effect of higher-Octane rating of petrol on engine performance.	**4**	**CO4**
Q 5	Explain the process of knocking in Diesel engine.	**4**	**CO2**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Draw and explain the valve timing diagram of a 4-stroke diesel engine. Give proper justification for all timings.	**10**	**CO2**
Q 7	Draw and explain the phases of combustion in a petrol engine.	**10**	**CO2**
Q 8	Discuss various methods to provide swirl inside Diesel engine for higher utilization of air during combustion.	**10**	**CO4**
Q 9	A single cylinder and stroke cycle I.C. engine when tested, the following observations available : Mean effective pressure is 7.5 bar, Speed of engine = 400 rpm, Brake drum diameter = 120 cm, Dead weight on brake = 380 N, Spring balance reading = 50 N, Fuel consumption = 2.8 kg/hr., CV = 42000 kJ/kg, Cylinder diameter = 16 cm, Piston stroke = 20 cm. Find (i) F.P., (ii) Mechanical efficiency, (iii) bsfc, and (iv) Brake thermal efficiency. **OR**	**10**	**CO3**

	A 4-cylinder, 4-stroke cycle engine having cylinder diameter 100 mm and stroke 120 mm was tested at 1600 rpm and the following readings were obtained. Fuel consumption = 0.27 litres/minute, Specific gravity fuel = 0.74, B.P. = 31.4 kW, Mechanical efficiency = 80%, Calorific value of fuel= 44000 kJ/kg. Determine: (i) bsfc (ii) imep (iii) Brake thermal efficiency.		
SECTION-C (2Qx20M=40 Marks)			
Q 10	For an Otto cycle air is having initial pressure of 1 bar and 70 °C temperature is compressed adiabatically until the pressure is 7 bar followed by addition of 465 kJ of heat per kg of air at constant volume. Determine : (i) Compression ratio of the engine. (ii) Temperature at the end of compression. (iii) Temperature at the end of heat addition. Take for air C_p = 1.0 kJ/kg K, C_v = 0.706 kJ/kg K.	**20**	**CO3**
Q11	A spark ignition engine on test consumes 5 kg/h of petrol when running on an air-fuel ratio of 16 : 1. The engine uses a single-jet carburettor having a fuel orifice area of 2 sq mm and the tip of the jet is 5 mm above the level of petrol in the float chamber, when the engine is not running. Calculate the depression in the venturi throat to maintain the required fuel flow rate through the carburettor. Assume specific gravity of petrol as 0.75 and the coefficient of discharge of the fuel orifice as 0.8. What area of venturi throat will be required to maintain the desired flow rate? Density of air is 1.20 kg/m^3 and the coefficient of discharge for venturi throat is 0.8. **OR** During the trial of a single-cylinder oil engine of cylinder diameter 200 mm, stroke 280 mm is working on two-stroke cycle, the following observations were made in one hour: Total fuel used = 4.22 kg Calorific value = 44670 kJ/kg Total number of revolutions = 21000 Mean effective pressure = 2.74 bar Net brake load applied to a drum of 1 m diameter = 600 N Total mass of cooling water circulated = 495 kg Intel temperature of cooling water = 13 °C Outlet temperature of cooling water = 38 °C Air used = 135 kg Temperature of air in test room = 20 °C Temperature of exhaust gases = 370 °C Assume : C_p (gases) = 1.005 kJ/kgK ; C_p (steam) at atmospheric pressure = 2.093 kJ/kgK. Calculate the indicated thermal efficiency and draw the heat balance.	**20**	**CO4**