Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2023

Course: Internal Combustion Engines **Semester : IV**
Program: Automotive Design Engineering **Time : 03 hrs.**
Course Code: MEAD2007 **Max. Marks: 100**

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Differentiate between ideal and actual Otto cycle with a suitable diagram.	**4**	**CO1**
Q 2	What is the requirement of an ideal IC engine fuel? What do you understand by "DOPES"?	**4**	**CO1**
Q 3	Discuss the effect of cooling system on engines performance.	**4**	**CO2**
Q 4	A gasoline engine works on Otto cycle. It consumes 7 kgs of gasoline per hour and develops brake power at the rate of 20 kW. The specific gravity of gasoline is 0.8 and its calorific value is 44000 kJ/kg. Find the brake thermal efficiency of the engine.	**4**	**CO3**
Q 5	Discuss the working principle of an EGR system and what are its benefits?	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	In a testing of a single cylinder oil engine, the following observations were made: Oil consumption =12 kg/h Calorific value of fuel =43 MJ/kg Speed =2000 rpm Torque on brake drum =210 N-m Quantity of cooling water used =15.5 kg/min Temperature rise of cooling water =35 °C Exhaust gas temperature =410°C Room temperature =20°C Cp of exhaust gases =1.17 kJ/kg K		**10**	**CO3**

	Mechanical efficiency =85% Draw the heat balance sheet on minute basis.		
Q 7	A two stroke, 3 cylinder engine has a mean effective pressure (mep) of 6 bar. The speed of engine is 1000 rpm. If the bore and stroke are 110 mm and 140 mm, respectively, find the indicated power developed and the brake power if the mechanical efficiency of the engine is 80%.	**10**	**CO3**
Q 8	Discuss the methods of providing Swirl and Turbulence in diesel engine with the help of neat sketch of the combustion chamber.	**10**	**CO4**
Q 9	Explain the procedure to determine the indicated power of an engine by MORSE test. **OR** Write short note on: i. Multi Point Fuel Injection. ii. Idling system in carburetor.	**10**	**CO2**
SECTION-C (2Qx20M=40 Marks)			
Q 10	Derive an expression to determine the air fuel ratio of an engine using an elementary carburetor, neglecting the compressibility of air.	**20**	**CO2**
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 all salient points in the cycle. (ii) Efficiency. (iii) Net work per cycle. (iv) Mean effective pressure. (v) Ideal power developed by the engine if the number of working cycles per minute is 250. **OR** An engine with 200 mm cylinder diameter and 300 mm stroke works on theoretical Diesel cycle. The initial pressure and temperature of air used are 1 bar and 27°C. The cut-off is 8% of the stroke and the compression ratio of engine is 15. Determine: (i) Pressures and temperatures at all salient points. (ii) Theoretical air standard efficiency. (iii) Mean effective pressure. (iv) Power of the engine if the working cycles per minute are 380.	**20**	**CO3**