Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3171923 Date:16-12-2024

Subject Name: Internal Combustion Engine

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	A 6-cylinder petrol engine operates on the four-stroke cycle. The bore of each cylinder is 70mm and the stroke 100mm. The clearance volume per cylinder is 67cm^3. At a speed of 3960 rpm the fuel consumption is 19.5 kg/h and the torque developed is 140 Nm. Calculate (a) the break power, (b) the break mean effective pressure (c) the break thermal efficiency if the calorific value of the fuel is 44000 k J/kg, and (d) the relative efficiency on a break power basis assuming the engine works on the constant volume cycle. Assume r = 1.4, for air.	**03**
	(b)	In an ideal constant volume cycle the pressure and temperature at the beginning of compression are 97 kN/ m^{2}and 40 °C resply. The volume ratio of compression is 7:1. The heat supplied during the cycle is 1200 K J/Kg of working fluid. Determine the maximum temperature attained in the cycle, thermal efficiency of cycle and work done during the cycle/ Kg of working fluid.	**04**
	(c)	Explain the following terms: Run on surface ignition, Run away surface ignition, wild ping, Rumble, Pre ignition	**07**
Q.2	**(a)**	A 10 cm X 12 cm four cylinder, 4 stroke engine running at 2000 rpm has a carburetor venturi with a 3 cm throat. Determine the suction at the throat assuming the volumetric efficiency of the engine to be 70 %. Assume density of air to be 1.2 Kg/ m^2 and coefficient of air flow of 0.8.	**03**
	(b)	Explain basic requirements of a good combustion Chamber.	**04**
	(c)	Compare the performance characteristics of SI and CI engines.	**07**
		OR	
	(c)	What are the key operating variables that distinguish SI and CI engines, such as compression ratio, air-fuel mixture preparation, and combustion timing?	**07**
Q.3	**(a)**	How does a carburetor adjust the air-fuel mixture according to different loads and speeds? What are the main factors affecting mixture requirements?	**03**
	(b)	Draw neat and labelled sketches of (1) Bosch fuel Injection Pump (2) Pintle Nozzle and Pintaux nozzle	**04**
	(c)	With neat sketch explain Stages of combustion in SI engines.	**07**

OR

Q.3	**(a)**	Explain the concept of detonation in CI engines. What factors contribute to the occurrence of detonation	**03**
	(b)	Draw neat and labelled sketches of (1) Solex carburetors (2) Cater Carburetor	**04**
	(c)	Compare different combustion chamber designs for SI engines. How do factors like chamber shape, piston geometry, and valve arrangement influence combustion efficiency and emissions?	**07**
Q.4	**(a)**	List desirable properties of Engine Lubricants.	**03**
	(b)	Compare various Engine cooling systems.	**04**
	(c)	What is supercharging? Explain thermodynamic cycle of supercharged I.C engine.	**07**

OR

Q.4	**(a)**	Explain S.A.E. rating of Lubricants.	**03**
	(b)	With neat sketch explain Engine Air cooling system.	**04**
	(c)	What is meant by pulse turbocharging? What are its advantages and disadvantages?	**07**
Q.5	**(a)**	Explain working principle of Wankel engine.	**03**
	(b)	Explain suitability of Biofuels as alternative fuel in I.C engines.	**04**
	(c)	Discuss the role of catalytic converters in controlling exhaust emissions from SI engines. How do they work, and what pollutants do they target?	**07**

OR

Q.5	**(a)**	Explain working principle of stratified charge engine.	**03**
	(b)	Explain effect of following parameters on exhaust emission. (1) Air fuel Ratio (2) Surface to volume ratio (3) Engine Speed	**04**
	(c)	What are the primary pollutants emitted from a spark-ignition engine, and how do they contribute to air pollution?	**07**

****