GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2024

Subject Code: 3171923   **Date:01-06-2024**
Subject Name: Internal Combustion Engine
Time:02:30 PM TO 05:00 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)	Differentiate SI and CI engines.	**03**
	(b)	Compare the properties of petrol and diesel with unconventional fuels.	**04**
	(c)	A single cylinder, 4-stroke diesel engine having swept volume of 850 cm^3 is tested at 300 rpm. When the braking torque of 50 Nm is applied, analysis of indicator diagram gives a mean effective pressure of 10 bar. Find the brake power and mechanical efficiency of the engine.	**07**
Q.2	(a)	Explain the working principle of exhaust gas calorimeter.	**03**
	(b)	Explain the orifice-chamber method for air consumption measurement in IC engine with neat sketch.	**04**
	(c)	A 4 cylinder 4-stroke SI engine of 60 mm bore and 90 mm stroke was tested at constant speed. The fuel supply was fixed to 0.13 kg/min and plugs of 4-cylinder were successively short-circuited without change of speed. The power measurements were as follows: BP with all cylinder working = 16.25 kW; BP with cylinder 1 cut-off = 11.55 kW; BP with cylinder 2 cut-off = 11.65 kW; BP. with cylinder 3 cut-off = 11.70 kW; BP with cylinder 4 cut-off = 11.50 kW. The calorific value of fuel is 42 MJ/kg. Find Indicated thermal efficiency of the engine and compare it with air standard efficiency. The clearance volume of one cylinder is taken as 50 cm^3.	**07**

OR

	(c)	The following observations are made during a trail on an oil engine. (1) Motor power to start the engine = 10 kW (2) R.P.M =1800 (3) Brake torque = 345 Nm (4) Fuel used = 16 kg/hour (5) C.V. of fuel used = 42 MJ/kg (6) Air supplied = 4.85 kg/min (7) Quantity of cooling water = 17 kg/min (8) Outlet temperature of cooling water = 68 ^{0}C (9) Room temperature = 21 ^{0}C (10) Exhaust gas temperature = 400 ^{0}C. Take C_{pw} = 4.2 KJ/kg. K and C_{pg} = 1.25 KJ/kg.K. **Determine** (a) B.P. (b) Mechanical efficiency (c) bsfc and (d) draw a heat balance sheet on kW basis and percentage basis.	**07**
Q.3	(a)	Define the following terms: (1) Ignition lag (2) Highest useful compression ratio (HUCR) (3) Performance number	**03**
	(b)	Explain the effects of knocking in SI engines in details.	**04**
	(c)	Explain the stages of combustion in CI engine using P-Θ (pressure-crank angle) diagram in details.	**07**

OR

Q.3	(a)	Differentiate knocking in SI and CI engines.	**03**
	(b)	Explain the Lanova air-cell combustion chamber with neat sketch.	**04**

(c) Enlist various design consideration parameters for good combustion chambers. Also explain any one modern combustion chamber used in SI engine with neat sketch. **07**

Q.4 (a) Enlist the functions of lubrication system. Designate the lubricating oil grade: SAE 20W/40. **03**

(b) Differentiate air cooling and water-cooling system in details. **04**

(c) Differentiate supercharging and turbocharging in details. **07**

OR

Q.4 (a) Define EURO-III and EURO-IV emission norms. **03**

(b) Explain the working principle of stratified charge engine with neat sketch. **04**

(c) Explain pressure feed lubrication system with neat sketch. **07**

Q.5 (a) Give the functions of following parts of simple carburetor. (1) Venturi (2) Float and float chamber (3) chock valve **03**

(b) Explain the compensating or double jet with neat sketch. **04**

(c) Enlist various types of nozzles used in CI engine. Also explain the Individual pump system with neat sketch. **07**

OR

Q.5 (a) Enlist the requirements of ideal injection system. **03**

(b) Write the chemically correct combustion equation for octane and define the practical A:F (air-fuel ratio) limit for SI engine. **04**

(c) Explain the following terms in details: **07**
(1) Ice formation (2) Vapour lock (3) Back-firing

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