Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–II • EXAMINATION – SUMMER - 2017

Subject Code: 2722107 Date: 26/05/2017

Subject Name: ADVANCED 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.**

Q.1	**(a)**	Define following terms: Brake torque, Brake thermal efficiency, Mechanical efficiency, Mean effective pressure, Specific fuel consumption, Air/fuel ratio, Emission index.	**07**
	(b)	Explain in brief: Enthalpy of formation, Enthalpy of combustion, Adiabatic combustion temperature, Dissociation	**07**
Q.2	**(a)**	Compare thermodynamic - constant volume and constant pressure cycles using diagram and also derive expression for efficiency for an Otto cycle.	**07**
	(b)	A four cylinder, four stroke petrol engine 6 cm bore and 9 cm stoke was tested at constant speed. The fuel supply was fixed to 0.15 kg/min and plugs of four cylinders were successively cut-off without change of speed. The power measured was as follows: with all four cylinders working = 16.25 kW, with 1^{st} cylinder cut off = 11.55 kWh, with 2^{nd} cylinder cut off= 11.65 kWh, with 3^{rd} cylinder cut-off = 11.70 kWh, with 4^{th} cylinder cut-off = 11.50 kWh. Find (i) the I.P. of an engine, (ii) mechanical efficiency, (iii) Indicated thermal efficiency if C.V. of fuel used is 42,000 kJ/kg and (iv) relative efficiency on I.P. basis assuming clearance volume as 65 cm^3.	**07**
		OR	
	(b)	The percentage analysis of gaseous fuel by volume is given as follows: CO_2=8%, CO=22%, O_2=4%, H_2=30% and N_2=36%. Determine the minimum volume of air required for complete combustion of 1 m^3 of gas and calculate the percentage composition by volume of the dry products of combustion. If 1.4 m^3 of air is supplied per m^3 of gas, what will be the percentage by volume of CO_2 in the dry products of combustion?	**07**
Q.3	**(a)**	Mention the effect of the following parameters on engine performance: Ignition delay, Cetane number, Fuel spray structure	**07**
	(b)	What is turbo-charging and supercharging? What are their applications?	**07**
		OR	
Q.3	**(a)**	What is MPFI? Explain it in brief.	**07**
	(b)	What are the Indian emission standards for SI and CI engines? Explain their significance.	**07**
Q.4	**(a)**	Which are the various emissions from the IC Engine? What are their sources of generation in IC Engine?	**07**
	(b)	Explain various stages of combustion in SI engine with the help of diagram.	**07**
		OR	
Q.4	**(a)**	List various alternate fuels for I C Engine and their required properties.	**07**
	(b)	What are the pros and cons of biodiesel production and its usage? Comment	**07**

on the future of biodiesel fuel from the Indian market point of view.

Q.5	**(a)**	What do you understand by thermal loading on engine components? What are the requirements of lubrication for an IC engine?	**07**
	(b)	What is Morse test? Explain its procedure to calculate the friction power.	**07**

OR

Q.5	**(a)**	What are hybrid vehicles? What will be its role in future from energy and environment point of view?	**07**
	(b)	What are the stratified charge engines and HCCI engines – explain them in brief.	**07**

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