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Fifth Semester B.E. Degree Examination, Dec.2024/Jan.2025

Automotive Fuels and Combustion

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 Explain the following energy sources:
- i) Crude oil
 - ii) Solar energy
 - iii) Wind energy
 - iv) Fuel cells
 - v) Hydrogen
- (20 Marks)

OR

- 2 a. Sketch and explain the petroleum refining process by fractional distillation. (08 Marks)
- b. Explain:
- i) Paraffin series
 - ii) Olefin series
 - iii) Napthene series
 - iv) Aromatic series.
- (12 Marks)

Module-2

- 3 a. What are the properties of good air-fuel mixture? Explain in brief. (04 Marks)
- b. Write a note on the following:
- i) LPG as SI engine fuel
 - ii) Alcohols as diesel fuel
 - iii) Biodiesel
 - iv) CNG (Compressed Natural Gas).
- (16 Marks)

OR

- 4 a. The percentage analysis of gaseous fuel by volume is given as follows:
 $\text{CO}_2 \rightarrow 8\%$, $\text{CO} \rightarrow 22\%$, $\text{O}_2 \rightarrow 4\%$, $\text{H}_2 \rightarrow 30\%$, $\text{N}_2 \rightarrow 36\%$. Determine the minimum volume of air required for complete combustion of 1m^3 of gas and calculate the percentage composition by volume of the dry products of combustion. If 1.4m^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? (12 Marks)
- b. Explain the flue gas analysis by gas chromatography. (08 Marks)

Module-3

- 5 a. Explain the effect of engine variables on ignition lag. (10 Marks)
- b. Explain the effect of engine variables on detonation. (10 Marks)

OR

- 6 a. Explain the stages of combustion in a CI engine. (10 Marks)
- b. Discuss the variables affecting delay period in CI engine. (10 Marks)

Module-4

- 7 a. What is dynamometer? Explain working of Eddy current dynamometer with neat sketch. (10 Marks)
b. Explain the method to find frictional power using Morse test and motoring test. (10 Marks)

OR

- 8 a. Briefly explain the Willam's lime method for measurement of frictional power. (06 Marks)
b. In a trial of a 4 cylinder 4-stroke petrol engine of 90 mm bore and 100 mm stroke the net dynamometer load was 1400 N at a radius of 460 mm, when the speed was 2200 rpm. At the same speed and trouble opening the engine required 4 kW to motor it with the ignition switched off.
i) Calculate the mechanical efficiency and indicated mean effective pressure.
ii) During a 3 minute run at this speed and power the engine used 2.4 kg of petrol of calorific value 42980 kJ/kg and 100 kg of cooling water with a temperature rise of 40°C. Draw up a heat balance for the test in kJ/min. (14 Marks)

Module-5

- 9 a. With a neat sketch, explain the working principle of dual fuel engine. (08 Marks)
b. Describe the factors affecting combustion in a dual fuel engine. (12 Marks)

OR

- 10 a. Explain the characteristics of multi-fuel engine. (08 Marks)
b. What are the modifications required for the fuel system of multi-fuel engine? (12 Marks)

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