Code No: R1931241    **R19**    **SET - 1**

**III B. Tech I Semester Regular Examinations, February-2022**
**FUELS AND COMBUSTION**
(Automobile Engineering)

Time: 3 hours                                                 Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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## UNIT-I

1. a) What are the characteristics of a good fuel? Discuss the advantages and disadvantages of solid fuels by giving some examples. [8M]

   b) What are the different types of coal and briefly discuss about Proximate and Ultimate analyses of coal. [7M]

**(OR)**

2. a) Discuss briefly about the gasification of coal and various steps involved in it. [8M]

   b) What is meant by coal liquefaction? Explain the method of hydrogenation process of coal. [7M]
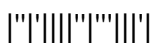
## UNIT-II

3. a) Discuss the advantages and disadvantages of liquid fuels and give examples. Also list out some important petroleum products. [8M]

   b) Why purification is necessary? Explain the specific aims of purification process. [7M]

**(OR)**

4. a) What are the merits and limitations of gaseous fuels? Also classify the gaseous fuels. [8M]

   b) Explain the salient features of [7M]
   i) Blast furnace gas    ii) Producer gas and    iii) LPG

## UNIT-III

5. a) What is meant by stoichiometric air? Explain how stoichiometric air can be evaluated by taking suitable example. [8M]

   b) The percentage weight analysis of a fuel supplied to an IC engine is as follows: C = 85%, $H_2$ = 15%. The air fuel ratio is 13.5:1. If all the carbon burnt either to CO or $CO_2$ and if there is no free oxygen in the exhaust gases, calculate [7M]
      i) volumetric analysis of the dry products of combustion
      ii) heat lost by incomplete combustion expressed as percentage of gross calorific value. Calorific value of C burning to $CO_2$ = 34440 kJ/kg; Calorific value of C burning to CO = 10395 kJ/kg; Calorific value of $H_2$ burning to $H_2O$ = 144900 kJ/kg.

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**(OR)**

6. a) What do you understand by Zeroth order, 1st order, 2nd order and higher order equations? Explain with examples. [8M]

   b) What is meant by reaction rate? Discuss the factors affecting reaction rate. [7M]

## UNIT-IV

7. a) Explain the following terms : [8M]
   i) Excess air　　　　　　　　ii) Dew point temperature
   iii) Enthalpy of formation

   b) 33.658 g of oxygen was used to completely react with a sample of a hydrocarbon in a combustion reaction. The reaction products were 33.057 g of carbon dioxide and 10.816 g of water. Find out the empirical formula of the compound. [7M]

**(OR)**

8. a) Explain about [8M]
   i) Combustion reaction temperature
   ii) Free energy of formation　　　　iii) Equilibrium constant

   b) The analysis by weight of fuel supplied to a boiler was carbon 84%, hydrogen 8%, oxygen 2% and remainder incombustible matter. Find the weight of air required for complete combustion of 1 kg of fuel. [7M]

## UNIT-V

9. a) What is meant by flame stability? Explain the structure of flame by clearly distinguishing between laminar and turbulent conditions. [8M]

   b) Explain the procedure of measurement of burning velocity and factors affecting it. [7M]

**(OR)**

10. a) Explain the mechanism of carbon monoxide and oxygen reaction. [8M]

    b) Discuss about the adiabatic flame temperature and limits of inflammability. [7M]

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