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**Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018**  
**Automotive Fuels and Combustion**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

**PART – A**

- 1 a. What is meant by renewable energy sources? Explain in brief these energy sources with special references to Indian context. (10 Marks)  
 b. Write short notes on : i) Wind energy ii) Fuel cells. (10 Marks)
- 2 a. Give the General formula of the following fuels :  
 i) Paraffin ii) Olefins iii) Naphthene iv) Aromatic. Also state their molecular arrangements and mention whether they are saturated or unsaturated. (10 Marks)  
 b. Can alcohol be used for CI engines? Explain. (05 Marks)  
 c. What are the advantages and disadvantages of using natural gas as alternate fuels? (05 Marks)
- 3 a. Is the air fuel ratio expressed on a mole basis identical to the air – fuel ratio expressed in a mass basis? Brief. (05 Marks)  
 b. How does the presence of moisture in air affect the outcome of a combustion process? (05 Marks)  
 c. One Kmol of Octane ( $C_8H_{18}$ ) is burned with air that contains 20 Kmol of  $O_2$ . Assuming the products contains only  $CO_2$ ,  $H_2O$ ,  $O_2$  and  $N_2$ , determine the mole number of each gas in the products and the air – fuel ratio for this combustion process. (10 Marks)
- 4 A test on a single – cylinder, four-stroke oil engine having a bore of 15cm and stroke 30cm gave the following results : Speed 300rpm ; Brake torque 200Nm ; Indicated mean effective pressure 7 bar ; Fuel consumption 2.4 kg/h ; Cooling water flow 5kg/min ; Cooling water temperature rise  $35^\circ C$  ; Air – fuel ratio 22 ; Exhaust gas temperature  $410^\circ C$  ; Barometer pressure 1 bar ; Room temperature  $20^\circ C$ . The fuel has a calorific value of 42 MJ/kg and contains 15% by weight of hydrogen. Take latent heat of vaporization as 2250 KJ/kg. Determine
  - i. The indicated thermal efficiency.
  - ii. The volumetric efficiency based on atmospheric conditions.
  - iii. Draw up a heat balance in term of KJ/min. Take  $C_p$  for dry exhaust gas = 1KJ/kg K and Super heated steam  $C_p = 2.1$  KJ/kg K ;  $R = 0.287$  KJ/kg K. (20 Marks)

**PART – B**

- 5 a. Briefly explain the following :  
 i) Time loss factor ii) Heat loss factor iii) Exhaust blow down factor. (10 Marks)  
 b. What will be the effect on efficiency of an Otto cycle having a compression ratio of 8, if  $C_v$  increases by 1.6%? (10 Marks)

- 6 a. Briefly explain the stages of combustion in SI engines elaborating the flame front propagation (10 Marks)  
b. Explain the effect of various engine variables on SI engine knock. (10 Marks)
- 7 a. What is delay period and what are the factors that affect it? (10 Marks)  
b. Explain with figures the various types of combustion chambers used in CI engines. (10 Marks)
- 8 a. With a neat sketch, explain the working principle of dual fuel engine. (10 Marks)  
b. Explain the modifications of fuel systems in multi fuel engines. (10 Marks)

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