



## P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

**Fifth Semester, B.E. - Automobile Engineering**

**Semester End Examination; Dec - 2016/Jan - 2017**

**Automotive Fuels and Combustion**

*Time: 3 hrs*

*Max. Marks: 100*

*Note: Answer FIVE full questions, selecting ONE full question from each unit.*

### UNIT - I

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|--|----|
| 1 a. Why there is a need for renewable sources of energy? Explain.   | 6  |
| b. List the advantages and disadvantages of Biomass energy.  | 6  |
| c. Briefly, explain the different applications of solar energy.  | 8  |
| 2 a. Describe the process of petroleum refining.   | 10 |
| b. Discuss briefly the following properties of fuels :   |    |
| i) Calorific value                      ii) Viscosity                                      iii) Specific gravity | 10 |
| iv) Vapour pressure                      v) Cloud and pour point.  |    |

### UNIT - II

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|---|----|
| 3 a. Write the combustion equations used to calculate the amount of oxygen required and the amount of gases produced.   | 10 |
| b. The gasoline used in an engine may be approximated to be hexane $C_6H_{14}$ . The percentage of dry exhaust gasses by volume at a particular load and speed of the engine are observed as: $CO_2 = 8.5\%$ , $CO = 7.8\%$ and $N_2 = 83.7\%$ . Determine; |    |
| i) The air fuel ratio required for chemically complete combustion   | 10 |
| ii) The mixture strength (A.F. ratio) in the test as a percentage of the chemically correct mixture.  |    |
| 4 a. List the important qualities of SI engine fuels and discuss any two.   | 10 |
| b. How is the rating done for CI Engine fuels?  | 4  |
| c. An engine working on Otto cycle has the following conditions :   |    |
| Pressure at the beginning of compression is 1 bar and pressure at the end of compression is 11 bars. Calculate the compression ratio and air-standard efficiency of the engine.   | 6  |
| Assume $\gamma = 1.4$ .   |    |

### UNIT - III

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|--|----|
| 5 a. List and discuss the stages of combustion in SI engines.                  | 10 |
| b. Discuss any five variables which affect the flame propagation in SI engine. | 10 |
| 6 a. Describe the various stages of combustion process in CI engine.           | 12 |
| b. Discuss the differences in the knocking phenomenon in SI and CI engines.    | 8  |

**UNIT - IV**

- 7 a. Discuss the meaning of a multi-fuel engine and its application areas. 4
- b. Explain the different characteristics of a multi-fuel engine. 8
- c. Discuss the working principle of dual-fuel engine. Explain any two factors affecting dual fuel combustion. 8
- 8 a. What are the important factors that affect combustion in a dual-fuel engine? 4
- b. Discuss the methods by which knock in a dual-fuel engine can be controlled. 10
- c. List the advantages of dual-fuel engine over a diesel engine. 6

**UNIT - V**

- 9 a. What is a stratified charge engine? Explain briefly. 4
- b. Discuss the following types of charge stratification by fuel injection and positive ignition :  
i) The first approach 10  
ii) Pre-chamber stratified charge.
- c. List the advantages and disadvantages of stratified charge engines. 6
- 10a. Discuss the various challenges in HCCI engine development. 10
- b. Write a note on VCR (Variable Compression Ratio). 4
- c. What is meant by a BICERI piston? Discuss with a neat sketch. 6

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