



## 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. - 2014**

**Automotive Fuels and Combustion**

*Time: 3 hrs*

*Max. Marks: 100*

*Note : i) Answer any FIVE full questions, selecting at least TWO full questions from each part.  
ii) Missing data may be suitably assumed and stated.*

### PART - A

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|-------|--|----|
| 1. a. | Discuss the need for renewable sources of energy.  | 6  |
|       | b. Discuss the advantages and disadvantages of biomass energy.   | 6  |
|       | c. Briefly explain the different applications of solar energy.   | 8  |
| 2 a.  | Discuss the basic families of hydrocarbons used in the fuel along with an example for each.  | 12 |
|       | b. Define the following terms;   | 8  |
|       | (i) Calorific value      (ii) Flash Point      (iii) Fire point      (iv) Viscosity  |    |
| 3 a.  | Write the combustion equations used to calculate the amount of Oxygen required and the amount of gases produced.   | 10 |
|       | b. The products of combustion of an unknown Hydrocarbon $C_xH_y$ have the following composition as measured by an Orsat apparatus:<br>CO <sub>2</sub> = 8.0%, CO = 0.9%, O <sub>2</sub> = 8.8% and N <sub>2</sub> = 82.3% Determine;   | 10 |
|       | (i) The composition of fuel  |    |
|       | (ii) The air fuel ratio  |    |
|       | (iii) The percentage of excess air used.   |    |
| 4 a.  | Discuss the antiknock quality and volatility properties of gasoline.   | 6  |
|       | b. Explain the rating of C.I engine fuels.   | 4  |
|       | c. A six cylinder gasoline engine operates on the four stroke cycle. The bore of each cylinder is 80 mm and the stroke 100 mm. The clearance volume per cylinder is 70 cc. At a speed of 4000 rpm the fuel consumption is 20 kg/h and the torque developed is 150 Nm. Calculate; |    |
|       | (i) The brake Power  | 10 |
|       | (ii) The brake mean effective pressure   |    |
|       | (iii) Brake thermal efficiency if the calorific value of the fuel is 43000 kJ/kg and   |    |
|       | (iv) Compression ratio   |    |

### PART - B

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|-------|--|----|
| 5. a. | Explain the Otto cycle. Compare Diesel cycle and Otto cycle.                   | 10 |
|       | b. Discuss the advantages and disadvantages of Induction swirl in C.I engines. | 6  |
|       | c. What is surface ignition? List the effects of surface ignition.             | 4  |

- 6. a. Explain the stages of combustion in S.I engines. 6
- b. Discuss the effect the following engine variables on flame propagation:
  - (i) Fuel-Air ratio
  - (ii) Compression ratio 10
  - (iii) Engine speed
  - (iv) Engine size
  - (v) Turbulence.
- c. What is meant by detonation in S.I engines? Explain. 4
- 7. a. What is meant by delay period? Discuss the variables affecting delay period in C.I engines. 10
- b. List the different types of combustion chambers used in diesel engines. Discuss the swirl combustion chamber. 10
- 8 a. What is dual fuel engine? Where does this type of engine finds application? 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

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