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

(An Autonomous Institution affiliated to VTU, Belagavi)

Seventh Semester, B.E. - Mechanical Engineering

Semester End Examination; Dec - 2017 / Jan - 2018

I.C. Engines

Time: 3 hrs

Max. Marks: 100

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

ii) Missing data, if any, may be suitably assumed.

UNIT - I

- 1 a. What are the factors to be considered for making fuel-air cycle calculations? 4
- b. Discuss the effect of the following variables on pressure and temperature at salient points of Otto cycle on the basis of fuel-air cycle : 8
- (i) Compression ratio (ii) Fuel-air ratio.
- c. The combustion in a diesel engine is assumed to begin at IDC and to be at constant pressure. The A/F ratio is 28:1, the calorific value of the fuel is 42 MJ/kg, and the sp.ht. of the products of combustion is given by $C_v = 0.71 + 20 \times 10^{-5} T$, R for the products is 0.287 kJ/kg K. 8
- If the compression ratio is 14:1, and the temperature at the end of compression is 800 K, find at what percentage of the stroke combustion is completed?
- 2 a. What are the requirements of an ideal gasoline fuel? Why volatility of gasoline is important? 6
- b. Explain briefly with a neat sketch the self-ignition characteristics of fuels. 6
- c. Define: (i) Octane number (ii) Cetane number. What are the advantages of high Octane fuel? 4
- d. What are the advantages and disadvantages of CNG as a fuel in SI engine? 4

UNIT - II

- 3 a. Explain with neat sketch mixture requirements in a SI engine. 6
- b. What are the drawbacks of simple carburettor? How are they overcome by incorporating compensating devices? 5
- c. Explain with pressure-crank angle diagram the stages of combustion in SI engines. 9
- 4 a. Explain the process of detonation with pressure-time diagram in SI engines. 6
- b. Discuss the following with reference to SI engine combustion chambers : 6
- (i) Induction swirl (ii) Squish and tumble (iii) Turbulence.
- c. With neat sketches explain: (i) Ricardo's turbulent head (ii) Divided combustion chambers. 8

UNIT - III

- 5 a. Explain with P- θ diagram the combustion phenomenon of CI engine. 10
- b. List the factors affecting the combustion in CI engines. 4
- c. What is diesel knock? List the methods of controlling diesel knock. 6

- 6 a. Differentiate between the knocking phenomenon of the SI and CI engines. 5
- b. What are the factors to be considered for designing combustion chambers for CI engines? 7
- c. With neat sketches explain pre-combustion and M combustion chambers for CI engines. 8
What are their advantages and disadvantages?

UNIT - IV

- 7 a. What are the essential requirements to be full filled by a fuel injection system for CI engine? 4
- b. Briefly explain: (i) Air injection (ii) Solid injection. 4
- c. Explain with neat sketches: (i) Common-rail system (ii) Distributor system. What are their advantages? 8
- d. List the operating variables which affect the engine heat transfer. 4
- 8 a. Explain briefly: (i) Pintle nozzle (ii) Pintaux nozzle with sketches. 6
- b. What do you mean by direct and indirect injection? What are the limitations of petrol injection? 6
- c. Explain briefly the following methods of water cooling : 8
(i) Pressurized water cooling (ii) Evaporative cooling.

UNIT - V

- 9 a. What is supercharging? Compare actual naturally aspirated and super charged engine with the help of P-V diagram. 5
- b. With neat sketches explain briefly the super charging arrangements. 10
- c. What is turbo charging? What are its functions? 5
- 10 a. Explain briefly the factors which effect the formation of NO_x . 4
- b. Discuss briefly the following with regard to S.I. engines : 6
(i) Crank case emission (ii) Evaporative emission (iii) Exhaust emission.
- c. With a neat sketch explain briefly EGR. 6
- d. Discuss the effects of engine emission on human health. 4

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