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

(An Autonomous Institution affiliated to VTU, Belgaum)

Seventh Semester, B.E. - Mechanical Engineering

Semester End Examination; Dec - 2016/Jan - 2017

I.C. Engines

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Assume suitably missing data, if any.

UNIT - I

1 a. Explain the effect of Fuel-air ratio on;
(i) Efficiency (ii) Maximum power (iii) Maximum temperature
(iv) Maximum pressure (v) Exhaust temperature. 10

b. In a Diesel engine, combustion is assumed to begin at inner dead centre and to be at constant pressure. The air fuel ratio is 28:1, the calorific value of fuel is 42 MJ/kg, the specific heat of product of combustion is given by C_v = 0.678+0.00013T kJ/kgK, R for the products = 297 J/kgK. If the compression ratio is 14:1 and the temperature at the end of compression is 800 K. Find, at what percentage of stroke combustion is complete? 10

2 a. How the constituents of crude petroleum are classified? Explain each series of constituents giving their chemical structure. Also mention whether they are saturated or not? 10

b. Explain the effect of fuel volatility on the following engine performance :
(i) Cold starting (ii) Hot starting (iii) Vapour lock
(iv) Carburetor Icing (v) Engine Warm-up. 10

UNIT - II

3 a. What are the limitations of an elementary carburetor? With neat diagram, explain the working of an elementary carburetor. 10

b. Explain the effect of the following engine variables on ignition lag;
(i) Fuel (ii) Mixture ratio (iii) Initial temperature and pressure
(iv) Electrode gap (v) Turbulence. 10

4 a. With a neat pressure versus crank angle diagram, explain the stages of combustion in S.I. engine. 10

b. Explain the effect of following engine variables on flame propagation in SIE;
(i) Fuel-air ratio (ii) Compression ratio (iii) In take temperature and pressure
(iv) Engine load (v) Turbulence. 10

UNIT - III

5 a. With a neat P-θ diagram, explain the stages of combustion in CI Engine. 10

Contd….2

b. Explain the delay period in C.I. Engine combustion. Also explain the effect of the following engine variables on delay period, 10

(i) Fuel (ii) Injection Pressure (iii) Compression ratio.

6 a. What are basic methods of generating air swirl in the C.I. engine combustion chambers? Explain how the induction swirl is created? Give any two disadvantages of Induction swirl. 10

b. Sketch and explain M.A.N. 'M' combustion chamber. 10

UNIT - IV

7 a. Draw the schematic diagram of air injection system and explain it. Give any two advantages and disadvantages of an inspection system. 10

b. Sketch and explain : 10

(i) Pintle nozzle (ii) Pintaux nozzle.

8 a. Briefly discuss the effects of the following factors on the piston temperature in an engine.

(i) Heat transfer coefficient and combustion system (ii) Engine load 12

(iii) Type of cooling (iv) Engine speed.

b. Sketch and explain the thermo siphon cooling. 8

UNIT - V

9 a. What is super charging? Explain the objectives of super charging. 8

b. With neat sketch explain, Volkswagen PCI stratified charge engine. 12

10 a. Explain how NO_x is formed during combustion? Also explain how to control the formation of NO_x emission by using EGR? 10

b. Explain :

(i) Thermal reactor package 10

(ii) Catalytic converter package.

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