



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. - 2015

Automotive Engines and Components

Time: 3 hrs

Max. Marks: 100

- Note:** i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.
 ii) Draw Pencil Sketches.
 iii) Missing data, if any, may be suitably assumed and stated.

UNIT - I

- 1 a. Briefly discuss about the classification of IC Engines based on various considerations. 6
- b. Sketch a four stroke petrol engine valve timing diagram in relation to pressure volume diagram. Explain the ACTUAL intake and exhaust valve timing of a 4 stroke SI Engine, duly mentioning MECHANICAL and DYNAMIC FACTORS. 10
- c. Sketch a detailed valve timing diagram for a Four stroke SI engine for the following details:
 Inlet Valve opens about 10° before TDC;
 Inlet Valve opens up to 60° after BDC;
 Exhaust Valve opens about 55° before BDC;
 Exhaust Valve opens up to 20° after TDC;
 Ignition about 30° before TDC; 4
- 2 a. How Two Stroke Engines are classified? With neat sketches, describe, Preblowdown, Blowdown, Scavenging and additional Charging, the four distinctive periods of scavenging in a Two stroke engine. 10
- b. Along with sketch, compare different scavenging systems, along with a reference of theoretical scavenging processes. 6
- c. Sketch a detailed port timing diagram for a Two stroke SI engine for the following details;
 Exhaust Port Opens about 43° before BDC;
 Exhaust Port Opens up to 35° after BDC;
 Inlet Port Opens about 35° before BDC;
 Inlet Port Opens up to 43° after BDC;
 Ignition about 20° before TDC; 4

UNIT - II

- 3 a. Sketch and explain, cylinder wear due to abrasion, erosion and corrosion. What do you mean by heat cracks in cylinder walls? 8
- b. Explain, with sketch any one type of exhaust muffler. 6

c. A vertical four stroke CI engine has the following specifications;

Brake power = 4.5 kW

Speed = 1200 rpm

imep = 0.35 N/mm²

$\eta_{mech} = 0.80$

6

Determine the dimensions of the cylinder.

4 a. Sketch and Explain the following :

i) Separate and integral cylinder heads

12

ii) Dry liner and wet liner

b. Write a note on Production of Engine Blocks, duly mentioning various operations involved.

8

UNIT - III

5 a. What are the Functions of piston, piston pin, and piston rings?

5

b. Design and draw a cast iron piston for a single acting IC Engine from the following data:

Diameter of cylinder Bore = 250 mm

Maximum explosion pressure = 4.91 N/mm²

Permissible stress for CI Engine = 39.24 N/mm²

Permissible stress for piston ring = 98.1 N/mm²

Radial wall pressure = 0.04 N/mm²

Permissible bearing pressure for pin = 19.62 N/mm²

Permissible bending stress in pin = 63.77 N/mm²

15

6 a. What do you mean by piston slap and piston clearance? With neat sketches explain two methods each for preventing the same.

12

b. Sketch and explain about typical temperature distribution in pistons.

8

UNIT - IV

7 a. Briefly explain with neat sketches, different arrangements of connecting piston and connecting rod.

6

b. Design a connecting rod for four stroke petrol engine with the following data:

Diameter of piston = 88 mm

Stroke = 125 mm

Weight of reciprocating parts = 15.696 N

Length of connecting rod centre to centre = 300 mm

R.P.M. = 2200 with possible over speed of 3000

Compression ratio = 6.8; 1

14

Probable maximum explosion pressure (assumed shortly after dead centre, say when $\phi = 3^\circ$) = 3.4335N/mm².

Draw a neat dimensioned sketch of the complete connecting rod designed. Assume any further data required for the design.

- 8 a. Discuss the effect of following on deciding the optimum firing order of an engine : 6
- i) Engine vibration ii) Engine cooling iii) Development of back pressure.
- b. Sketch and explain the construction and function of a vibration damper. 6
- c. A force of 117.720 kN acts tangentially on the crankpin, of an overhang crank. The axial distance between the centre of the crank shaft journal and the crankpin is 400 mm and the crank is 500 mm long Determine;
- i) Diameter and length of the crankpin journal. 8
- ii) Diameter of the shaft journal, from the following data:
- Safe bearing pressure = 5.91 N/mm^2
- Bending stress = 63.77 N/mm^2
- Principal stress in the shaft journal = 63.77 N/mm^2

UNIT - V

- 9 a. Classify Mechanisms with side camshaft and mechanisms with overhead camshaft. Sketch and briefly explain any one in each group. 6
- b. Explain, with sketch the different Cam shaft drives. 6
- c. Determine the valve lift and valve dimensions of an engine from the following data:
- Max. gas pressure = 5 N/mm^2 , Cylinder bore diameter = 80 mm
- Gas velocity = 100 m/min, Mean piston speed = 300 m/min 8
- Allowable stress = 42 N/mm^2 , Valve seat angle = 30°
- Sketch the dimensioned sketch of the same.
- 10 a. Why Morse test is not suitable for single cylinder engine? Describe the method of finding friction power using Morse test? 6
- b. Schematically explain the use of the study of the heat balance of an engine. 8
- c. A single cylinder engine running at 1800 rpm develops a torque of 8 Nm. The indicated power of the engine is 1.8 kW. Find the loss due to friction power as the percentage of indicated power. 6

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