



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 Engines and Components

Time: 3 hrs

Max. Marks: 100

Note: i) Answer **FIVE** full questions selecting at least **TWO** full questions from each part

ii) Assume missing data suitably, if any

iii) Use of design data hand book is permitted, Draw pencil sketches.

PART - A

1. a. Write a note on history of automobiles duly mentioning the milestones. 4
- b. Distinguish clearly between the Ideal and actual working cycle, engine operation and valve timing for a four stroke SI engine. 12
- c. Compare two stroke SI and CI engine. 4
2. a. Sketch and explain the working of an uniflow –unsymmetrical separately scavenged type two stroke SI engine. 12
- b. Explain with neat sketches, pre blow down, blow down, scavenging and additional charging in a two stroke engine. 8
3. a. Distinguish between:
 - (i) Integral and separate cylinder head 10
 - (ii) Dry liner and Wet liner. Draw necessary Sketches.
- b. Write a note on production of engine blocks. 4
- c. A vertical 4 stroke CI engine has the following specifications; brake power = 4.5 kW; speed = 1200 rpm; i.m.e.p. = 0.35N/mm²; $\eta_{mech} = 0.80$. Determine the dimensions of the cylinder. 6
4. a. Explain piston slap, piston seizure and compensation for thermal expansion. 4
- b. Design a trunk type piston for 4 stroke single acting Diesel engine, developing 100 BHP per cylinder when running at 600 rpm. The piston should be complete with piston rings and gudgeon pin. The following data are given: maximum gas pressure: 4.9 N/mm², Average b.m.e.p. = 0.69 N/mm², Fuel used=0.18 kg and of calorific value 43961.4 kJ/kg
The Piston is of trunk type made of close grained cast iron. Allowable stress in bending may be taken as 29.42 to 34.32 N/mm². 16
Piston Rings are made of a special cast iron and should exert a radial pressure of 0.039N/mm², maximum allowable stress piston ring is to be not more than 85.36 N/mm². There is one scraper ring in addition to five pressure rings.

The connecting rod is to be four times the crank which is 120 mm, the allowable bearing pressure as the piston barrel (not including the ring of the piston) is not to exceed 0.39 N/mm^2 .

Piston pin or gudgeon pin is to be hollow and of floating type. The allowable bearing pressure should not exceed 15.69 N/mm^2 and the stress due to bending should be limited to 83.36 N/mm^2 . Calculate the dimensions of the piston complete with the piston rings and gudgeon pin and draw a neat dimensional sketch of the complete piston designed.

PART - B

- 5 a. Sketch and explain different methods of locking connecting rod with piston. 6
- b. Design a connecting rod for four stroke petrol engine with the following data; Diameter of the piston = 88 mm; Stroke = 125 mm. weight of reciprocating parts = 15.696 N, Length of connecting rod, centre to centre = 300 mm. Speed = 2200 rpm with possible over speed of 3000rpm compression ratio = 6.8:1. 14
- Probable maximum explosion pressure (assumed shortly after dead centre, say when $\phi = 3^\circ$) = 3.4335 N/mm^2 .
- 6 a. Explain the factors which must be considered before deciding the optimum firing order of an engine. 6
- b. Write a note on; vibration dampers, balancing of crank shafts. 6
- c. A force of 117.72 kN acts tangentially on the crank pin of an overhung crank. The axial distance between the centre of the crankshaft journal and the crank pin is 400 mm and the crank is 500 mm long. 8
- (i) Diameter and length of the crank pin journal
- (ii) diameter of the shaft journal.
- 7 a. List and explain with simple sketches, various valve operating mechanisms with overhead cam shaft. 12
- b. Write a note on automatic zero clearance tappets, sodium cooled valves and valve rotators. 8
8. With neat sketches, explain, the construction and working principle of any four of the following : 20
- (i) Six stroke IC Engine
- (ii) Variable valve timing (VVT)
- (ii) Camless Engines
- (iv) Swing piston engines
- (v) Wave disc engines.