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10AU53

Fifth Semester B.E. Degree Examination, May 2017
Automotive Engines and Components

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions, selecting at least TWO questions from each part.*
2. Use of design data hand book is permitted.

PART – A

1 a. With a neat sketch, explain the basic components of an engine and their nomenclature. **(10 Marks)**

b. Explain the theoretical and actual valve timing diagram of a four stroke spark ignition engine. Draw neat sketches. **(10 Marks)**

2 a. With neat sketches, explain the working principle of two stroke SI engine. **(10 Marks)**

b. Explain the following with graph:
i) Perfect scavenging
ii) Perfect mixing
iii) Short circuiting. **(06 Marks)**

c. Write the comparison between two stroke SI and CI engines. **(04 Marks)**

3 a. Write a short note on:
i) Cast iron cylinder block.
ii) Aluminium cylinder block. **(06 Marks)**

b. The cylinder of a four stroke diesel engine has the following specifications:
Brake power = 7.5kW, speed = 1400 rpm, indicated mean effective pressure = 0.35 MPa, mechanical efficiency = 80%, maximum gas pressure = 3.5MPa, reboring allowances = 3.2. The cylinder liner and head are made of grey cast iron (S_{ut} = 260N/mm^2 and μ = 0.25). The factor of safety for all parts is 6. Calculate:
i) Bore and length of the cylinder liner.
ii) Thickness of the cylinder liner.
iii) Apparent and net circumferential and longitudinal stress.
iv) Thickness of the cylinder head. **(14 Marks)**

4 a. Explain the following with a neat sketches:
i) Baffle type muffler.
ii) Wave cancellation type muffler
iii) Resonance type muffler
iv) Absorber type muffler. **(12 Marks)**

b. Explain:
i) General form of crankcase
ii) Crankcase ventilation. **(08 Marks)**

PART – B

5 a. With neat sketches, explain the full floating and semifloating type piston pin. **(06 Marks)**

b. Design a cast iron piston for a single acting four stroke engine for the following data: cylinder bore = 100mm, stroke = 125mm, maximum gas pressure = 5 N/mm^2, indicated mean effective pressure = 0.75 N/mm^2, mechanical efficiency = 80%, fuel consumption = 0.15 kg/kw/hr, higher calorific value = 42×10^3 kJ/kg, speed = 2000 rpm. Assume other data required for the design. **(14 Marks)**

6 Design a connecting rod for an IC engine for the following specifications: speed = 1800 rpm, maximum gas pressure = 3.15 N/mm^2, Diameter of the piston = 100mm, Mass of the reciprocating parts per cylinder = 2.25kg, length of connecting rod = 380mm, stroke = 190mm, compression ratio= 6:1, factor of safety = 6, length to Diameter ratio for big end bearing as 1.3 and small end bearing as 2, bearing pressure = 10 N/mm^2 and 15 N/mm^2 for big end and small end bearing, Density of rod material = 8000 kg/m^3. Allowable stress in the bolts as 60 N/mm^2 and in cap as 80 N/mm^2, the rod is to be of I-section and mild steel material for which compressive yield stress is 320 N/mm^2. Rankine's constant, $a = \frac{1}{7500}$. Draw a neat dimensional sketch showing provision for lubrication. **(20 Marks)**

7 a. Explain the functions, materials and construction of a crank shaft. **(10 Marks)**

b. What is balance weight? Explain the balancing of crankshaft with a neat sketch. **(10 Marks)**

8 With a neat sketch, explain the following:

a. Double row side valve mechanism.

b. Single row side valve mechanism.

c. Overhead inlet and side exhaust valve mechanism.

d. Single row overhead valve mechanism. **(20 Marks)**

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