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Seventh Semester B.E. Degree Examination, Feb./Mar.2022 **Automotive Engine Components Design & Auxiliary Systems**

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Use of Design data hand book is allowed.

Module-1

- 1 a. With simple sketches, explain the merits and limitations of,
- (i) Separate and Integral cylinder heads. (10 Marks)
 - (ii) Wet and Dry cylinder liners. (10 Marks)
- b. A vertical four stroke CI engine has the following specifications:
 Brake power = 4.5 kW, Speed = 1200 rpm, $imep = 0.35 \text{ N/mm}^2$, $\eta_{mech} = 0.80$.
 Determine the dimensions of the cylinder. (10 Marks)

OR

- 2 a. With sketches, explain any four methods used to compensate thermal expansion in pistons. (08 Marks)
- b. Determine the thickness of head of a cast iron piston for a single acting 4-stroke engine for the following specifications: Cylinder bore = 100 mm, Stroke = 120 mm, $bmeP = 0.65 \text{ MPa}$, Maximum gas pressure = 5 MPa, Fuel consumption = 0.227 kg/kW-hr, Speed = 2200 rpm and Calorific value = 41870 kJ/kg. (12 Marks)

Module-2

- 3 a. With a neat sketch, describe the function, material and construction of a connecting rod. (10 Marks)
- b. A reciprocating pump is used to raise the water against a head of 165 m, pump diameter is 450 mm and piston rod is 1400 mm long. Calculate the diameter of the piston rod. Use Rankine constant $K = \frac{1}{7500}$, FOS = 10, pressure on the piston = 1.61 MPa. (10 Marks)

OR

- 4 a. Describe the functions, materials and construction of a Crankshaft. (10 Marks)
- b. Design an overhung Crankpin for an engine having the following particulars:
 Cylinder diameter = 300 mm, Stroke = 500 mm, Maximum explosion pressure = 1.8 MPa, Speed = 200 rpm, Permissible bending stress for pin = 1000 MPa and Permissible bending stress = 85 MPa. (10 Marks)

Module-3

- 5 a. Explain with a neat sketch an over head valve operating mechanism. (10 Marks)
- b. Explain with a neat sketch valve timing importance in an engine. (10 Marks)

OR

- 6 a. With suitable sketches, explain the working of a two-stroke petrol engine. (10 Marks)
- b. With a neat sketch, explain theoretical scavenging process. (10 Marks)

Module-4

- 7 a. Write a note on IC engine manifolds with neat sketches showing inlet and exhaust manifolds for a multi-cylinder engine. (12 Marks)
b. With neat sketches, explain any two types of mufflers used in IC engines. (08 Marks)

OR

- 8 a. Compare air cooling and water cooling systems. (08 Marks)
b. Explain with a sketch, the functioning of thermostat assisted cooling system. (12 Marks)

Module-5

- 9 a. Enlist and discuss the important properties of a lubricant (any five). (10 Marks)
b. Discuss different types of lubricating oil filters commonly used. (10 Marks)

OR

- 10 a. Explain supercharging with a diagram of thermodynamic cycle. (10 Marks)
b. Explain turbocharging of two stroke engine with a neat sketch. (10 Marks)
