

B.E./B.TECH Degree Examination, December 2020

Semester - VI

**AE16601 – AUTOMOTIVE ENGINE COMPONENTS DESIGN**

(Regulation 2016)

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions**PART A - (8 X 2 = 16 marks)**

1. The function of gudgeon pin is to
  - (a) Act as stiffeners
  - (b) Support piston head
  - (c) Connect piston to connecting rod
  - (d) All of the above
2. The working cycle in case of four stroke engine is completed in following number of revolutions of crankshaft
  - (a) 1/2
  - (b) 1
  - (c) 2
  - (d) 4
3. Compression ratio of I.C. engines is
  - (a) the ratio of volumes of air in cylinder before compression stroke and after compression stroke
  - (b) volume displaced by piston per stroke and clearance volume in cylinder
  - (c) ratio of pressure after compression and before compression
  - (d) swept volume/cylinder volume
4. Engine pistons are usually made of aluminium alloy because it
  - (a) is lighter
  - (b) wears less
  - (c) absorbs shocks
  - (d) is stronger
5. State the significance of piston rings.
6. At what angle of the crank, the twisting moment is maximum in the crankshaft?
7. Identify the types of stresses set up in the flywheel rims.
8. Why the area of the inlet valve port is made larger than the area of exhaust valve port?

**PART B - (4 X16 = 64 marks)**

09. (a) Design a cast iron piston for a single acting four-stroke diesel engine with the **(16)** following data:  
Cylinder bore = 300 mm, Length of stroke = 450 mm, Speed = 300 rpm,  
Indicated mean effective pressure = 0.85 MPa, Maximum gas pressure = 5

MPa, Fuel consumption = 0.30 kg per BP per h, Higher calorific value of fuel = 44 000 kJ/kg. Assume suitable data if required and state the assumptions you make.

**(OR)**

- (b) Determine the dimensions of cross-section of the connecting rod for a diesel engine with the following data: **(16)**

Cylinder bore = 100 mm, Length of connecting rod = 350 mm, Maximum gas pressure = 4 MPa, Factor of safety = 6.

10. (a) Compare and contrast the methods and materials used in manufacture of crankshafts. **(16)**

**(OR)**

- (b) Discuss in detail the step by step procedure involved in designing a centre crankshaft when the crank is at dead centre. **(16)**

11. (a) A single cylinder, single acting, four stroke oil engine develops 20 kW at 300 r.p.m. The workdone by the gases during the expansion stroke is 2.5 times the workdone on the gases during the compression and the workdone during the suction and exhaust strokes is negligible. The speed is to be maintained within  $\pm 1\%$ . Determine the mass moment of inertia of the flywheel **(16)**

**(OR)**

- (b) Discuss the parameters to be considered while designing ring gears. State two advantages of ring gears. **(16)**

12. (a) Discuss the working principle of valve gear mechanism with neat sketch. **(16)**

**(OR)**

- (b) Design a rocker arm, and its bearings, tappet, roller and valve spring for the exhaust valve of a four stroke I.C. engine from the following data: **(16)**

Cylinder bore = 250 mm, Length of stroke = 300 mm, Engine speed = 450 rpm, Maximum gas pressure = 3.5 MPa, Effective length of each arm = 150 mm, Angle between two arms =  $165^\circ$ , Seat angle of valve =  $45^\circ$ , Mass of valve = 0.5 kg, Back pressure when the exhaust valve opens = 0.4 MPa, Maximum suction pressure = 0.02 MPa (below atmosphere). The valve opens  $33^\circ$  before outer dead centre and closes  $1^\circ$  after inner dead centre. The valve is to open and close with constant acceleration and deceleration for each half of the lift. Assume suitable data and state the assumptions you make.

