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Question Paper Code : 20153

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Sixth Semester

Automobile Engineering

AT 6601 — AUTOMOTIVE ENGINE COMPONENTS DESIGN

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define factor of safety.
2. Write short notes on stress concentration.
3. What are the criteria for selection of material for connecting rods?
4. Give the types of rings used in automobile engines.
5. Name the few materials used for crankshaft.
6. Mention the various forces acting on a crank shaft.
7. List out the various functions of a flywheel.
8. Define coefficient of fluctuation of energy.
9. Why the area of the inlet valve port is made larger than the area of exhaust valve port?
10. Define the term spring index.

PART B — (5 × 13 = 65 marks)

11. (a) A journal of nominal or basic of 75 mm runs in a bearing with close running fit. Find the limits of shaft and bearing. What is the maximum and minimum clearance?

Or

(b) The maximum load on a petrol engine push rod 300 mm long is 1400N. It is hollow having the outer diameter 1.25 times then inner diameter. Spherical seated bearings are used for the push rod. The modulus of Elasticity for the material of the push rod is 210 kN/mm². Find the suitable size for the push rod, taking a factor of safety of 2.5.

12. (a) A four stroke diesel engine has the following specifications :

Brake power = 5kW; Speed = 1200rpm; Indicated mean effective pressure = 035 N/mm²; Mechanical efficiency = 80%. Determine (i) Bore and length of the cylinder (ii) Thickness of the cylinder head and (iii) Size of studs for the cylinder head.

Or

(b) Describe the design details of connecting rod for a four cylinder four stroke SI engine.

13. (a) Describe the design details of centre crankshaft for a four cylinder four stroke C.I. engine.

Or

(b) Design a side or overhung crankshaft for a 250 mm × 300 mm gas engine. The weight of the flywheel is 30 kN and the explosion pressure is 2.1 N/mm². The gas pressure at the maximum torque is 0.9 N/mm², when the crank angle is 35° from I.D.C. the connecting rod is 4.5 times the crank radius.

14. (a) The turning moment diagram for a petrol engine is drawn to the following scales:

Turning moment diagram = 5 N-m; crank angle, 1 mm= 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line, taken in order are 295, 685, 40, 340, 960, 270 mm².

Determine the mass of 300 mm diameter flywheel rim when the coefficient of fluctuation of speed is 0.3% and the engine runs at 1800 rpm. Also determine the cross section of the rim when the width of the rim is twice of thickness. Assume density of rim material as 7250 kg/m³.

Or

(b) A single cylinder, single acting, four stroke oil, engine develops 20 kW at 300 rpm. The work done by the gases during the expansion stroke is 2.3 times the work done on the gases during the compression and the work done during the suction and exhaust strokes is negligible. The speed is to be maintained with in ± 1%. Determine the mass moment of inertia of the Flywheel.

15. (a) Design the various components of the valve gear mechanism for a horizontal diesel engine for the following data: Bore = 140 mm; stroke = 270 mm; power = 8.25 kW; speed = 475 rpm; maximum gas pressure = 3.5 N/mm²

The valve opens 33° before outer dead centre and closes 1° after inner dead centre. It opens and closes with constant acceleration and declaration for each half of the left. The length of the rocker arm on either side of the fulcrum is 150 mm and the included angle is 160°. The weight of the valve is 3N.

Or

(b) Describe in detail the various design aspects of intake and exhaust manifolds.

PART C — (1 × 15 = 15 marks)

16. (a) Design and draw a valve spring of a petrol engine for the following operating conditions:

Spring load when the valves is open = 400 N,

Spring load when the valve is closed = 250 N,

Maximum inside diameter of spring = 25 mm,

Length of the spring when the valve is open = 40 mm

Length of the spring when the valve is closed = 50 mm

Maximum permissible shear stress = 400 MPa.

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:

Diameter of the valve head = 80 mm; Lift of the valve = 25 mm; mass of associated parts with the valve = 0.4 kg; angle of action of camshaft =110°; RPM of the crankshaft = 1500.

From the probable indicator diagram, it has been observed that the greatest back pressure when the exhaust valve opens is 0.4 N/mm² and the greatest suction pressure is 0.02 N/mm² below atmosphere. The rocker arm is to be of I-section and the effective length of each arm may be taken as 80 mm; the angle between the two arms being 135°. The motion of the valve may be assumed S.H.M., without dwell in fully opened position. Choose your own materials and suitable values for the stresses. Draw fully dimensioned sketches of the valve gear.

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