Sem VII /CBGS/AUTO/AD/M-J-16

25105116

05

QP Code : 31343

(3 Hours) **[Total Marks : 80**

Note:

i) Question No. 1 is compulsory.
ii) Attempt any Three questions from remaining.
iii) Use of Design Data Hand book is permitted.
iv) Assume suitable data if required.

1. Attempt any Four of the following 5 X 4 =20

(a) What are the desirable properties of cylinder materials? Name the materials used for engine cylinder.

(b) Why is heat dissipation necessary in clutches? What are drawbacks of asbestos friction materials?

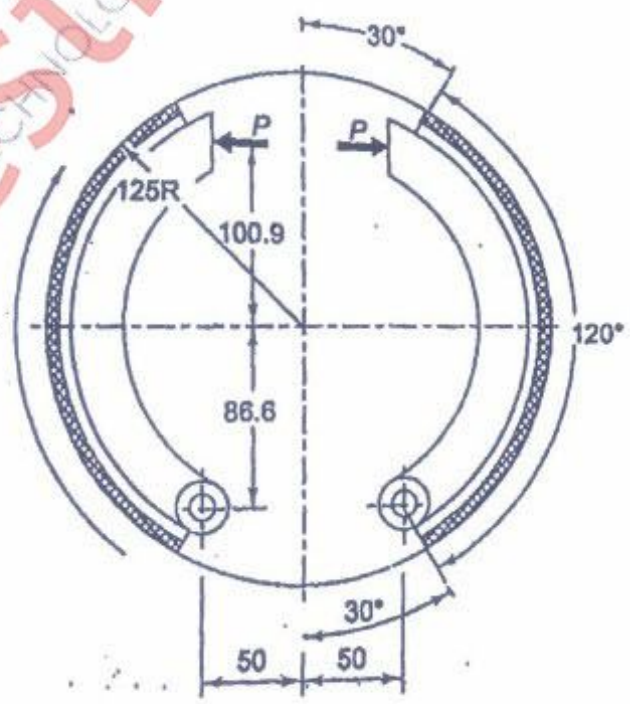
(c) List the important factors upon which the capacity of a brake depends.

(d) Prepare a list of materials , specifying their characteristic used in automotive brake lining and clutch lining.

(e) Design a helical compression spring for a maximum load of 1000 N for a deflection of 25 mm using the value of spring index as 5.Maximum permissible shear stress for spring wire is 420 N/mm^2 and modulus of rigidity = 84 k N/mm^2

2. (a) An automotive internal expanding double shoe brake is shown in fig.The face width of the friction lining is 40 mm and the maximum intensity of normal pressure is limited to 1 N/mm^2 .The coefficient of friction is 0.32.The angle θ_1 can be assumed to be zero. Calculate: 10

i) the actuating force P ; and
ii) the torque absorbing capacity of the brake



(b) A semi elliptic spring used for automobile suspension, consists of two extra full length leaves and eight graduated length leaves, including the master leaf. The centre to centre distance between the two eyes is 1 m , The leaves are made of steel 55Si2Mo90 having $\sigma_{yt} = 1500$ N/mm^2 and E = 2.07x 10^5 N/mm^2 . The maximum spring load is 30 kN and the factor of safety is 2. The leaves are pre stressed so as to equalize stresses in all leaves under maximum load .Determine the dimensions of the cross section of the leaves and the deflection at the end of the spring.

3. (a) Explain Design considerations of cylinder. 05

(b) The following data is given for four stroke diesel engine: 15

Cylinder bore	= 100 mm
Stroke	= 125 mm
Brake mean effective pressure	= 0.65 MPa
Speed	= 2000 rpm
Fuel consumption	= 0.25 kg/BP/h
Maximum gas pressure	= 5 MPa
Higher calorific value of fuel	42000 kJ/kg

Assume that 5 % of the total heat developed in the cylinder is transmitted by the piston. The piston is made of grey cast iron and the permissible tensile strength is 37.5 N/mm^2 .Assume k = 46.6 W/m/°C and the temperature difference between the centre and edge of the piston head is 220 °C . Calculate:

i) The thickness of the piston head by strength consideration
ii) Which criterion decides the thickness of the piston head?
iii) State whether the ribs are required .If so, calculate the numbers and thickness of piston ribs

4. (a) Explain the design consideration of connecting rod. 05

(b) Design a centre crankshaft for single cylinder vertical engine using the following data: 15

Cylinder bore	= 125 mm
Stroke	= 150 mm
(L/r) ratio	= 4.5
Speed	= 2000 rpm
Weight of flywheel cum belt pulley	= 1kN
Maximum gas pressure	= 3 MPa
Total belt pull	= 2 kN
Width of hub for flywheel cum belt pulley	= 200 mm

The torque on the crankshaft is maximum when the crank turns through 22° from TDC and at this position the gas pressure inside the cylinder is 2.5 MPa. The belts are in horizontal direction.

5. (a) Why are connecting rods made of I sections? Name the materials used for connecting road and crankshaft 05

(b) Design an exhaust valve for a diesel engine using the following data: 15

Cylinder bore	= 250 mm
Stroke	= 300 mm
Speed	= 600 rpm

Mean velocity of gas through port	= 50 m/s
Maximum gas pressure	= 4 MPa
Seat angle of valve	= 45°
Allowable bending stress for valve	= 50 MPa

Calculte:

i) Diameter of the valve port
ii) Diameter of the valve head
iii) Thickness of the valve head
iv) Diameter of the valve stem
v) Maximum lift of the valve

6. (a) Design a helical compression spring of circular cross section wire to carry safely an axial compressive load of 6 kN at a maximum stress of 800 MN/mm^2 .The spring stiffness should be 25 kN/m and other proportions as follows:
Spring index = 6 to 8
Ratio of length to mean diameter of coil = 1.7 to 2.3 10
Determine:

i) Mean dimeter of coil
ii) Diameter of wire
iii) Length of coil when closed
iv) Length of coil before application of load

(b) Gear ratios for a small passenger car are as follows:

1st gear	= 4.2 : 1
2nd gear	= 2.56 : 1
3rd gear	= 1.52: 1
Top gear	= 1: 1

The module of the gear may be assumed as 3.25 mm. The smallest pinion in the gear train must have atleast 15 teeth , speed of the engine shaft = 1.52 x speed of lay shaft. Assuming straight teeth and one single lay shaft in the gear box. Calculate: 10

i) Centre distance between shaft and lay shaft
ii) Number of teeth in each gear wheel
iii) Actual gear ratios on the basis of results