BE/Sem VIP/CBCGS/AUTO/ND-19

Time: 3 Hours

Marks: 80

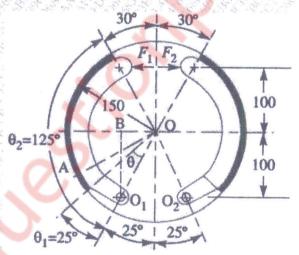
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Note:

- 1. Question No.1 is compulsory.
- 2. Attempt any three questions from remaining.
- 3. Use of Design Data Hand Book is permitted.
- 4. Assume suitable data if required.

1. Attempt any Four of the following

- (a) What are the Considerations in Designing a Friction Clutch?
- (b) Enlist the factors on which effective braking is depend?
- (c) What are the assumptions made in Lewis equation?
- (d) Write the Design Procedure for Crankshaft.
- (e) What are the Causes of Gear Tooth Failure?
- (a) Design a belt drive to transmit 110 kW for a system consisting of two pulleys of diameters 0.9 m and 1.2 center distance of 3.6 m, a belt speed 20 m/s, coefficient of friction 0.3, a slip of 1.2% at each pulley and 5% friction loss at each shaft, 20% over load.
 - (b) Fig. shows the arrangement of two brake shoes which act on the internal surface of a cylindrical brake drum. The braking force F₁ and F₂ are applied as shown and each shoe pivots on its fulcrum O₁ and O₂. The width of the brake lining is 35 mm. The intensity of pressure at any point A is 0.4 sin θ N/mm², where θ is measured as shown from either pivot. The coefficient of friction is 0.4. Determine the braking torque and the magnitude of the forces F₁ and F₂.



All dimensions in mm.

- Design a cast iron piston for a single acting four stroke engine for the following data:

 Cylinder bore = 100 mm, Stroke = 125 mm, Maximum gas pressure = 5 N/mm²,

 Indicated mean effective pressure = 0.75 N/mm², Mechanical efficiency = 80%; Fuel consumption = 0.15 kg per brake power per hour, Higher calorific value of fuel = 42

 * 10³ kJ/kg ,Speed = 2000 r.p.m.
 - Any other data required for the design may be assumed.
 - (b) Explain the splash lubrication system & pressure lubricating system.

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4. (a) A single dry plate clutch is to be designed to transmit 7.5 kW at 900 r.p.m. Find:

1. Diameter of the shaft,

2. Mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4,

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3. Outer and inner radii of the clutch plate, and

4. Dimensions of the spring, assuming that the number of springs are 6 and spring index = 6. The allowable shear stress for the spring wire may be taken as 420 MPa.

- (b) A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm², find the axial load which the spring can carry and the deflection per active turn
- 5. (a) Design a connecting rod for an I.C. engine running at 1800 r.p.m. and developing a maximum pressure of 3.15 N/mm². The diameter of the piston is 100 mm; mass of the reciprocating parts per cylinder 2.25 kg; length of connecting rod 380 mm; stroke of piston 190 mm and compression ratio 6: 1. Take a factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressures as 10 N/mm² and 15 N/mm². The density of material of the rod may be taken as 8000 kg/m³ and the allowable stress in the bolts as 60 N/mm² and in cap as 80 N/mm². The rod is to be of I-section for which you can choose your own proportions. Numerator constant may be taken as 320 N/mm² and the denominator constant 1/7500. Assume suitable data and state the assumptions you make
 - (b) Explain the valve gear mechanism for vertical engine with neat labelled diagram.
- 6. (a) Design a rocker arm, and its bearings, tappet, roller 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°; R. P. M. 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 180 mm; the angle between the two arms being 135°. The motion of the valve may be assumed S.H.M., without dwell in fully open position. Choose your own materials and suitable values for the stresses.
 - (b) What is slip of belt and creep of belt?

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