Roll No. Total No. of Pages : 03

Total No. of Questions : 09

B. Tech. (ME) (Sem.–6th)

MACHINE DESIGN-II

Subject Code : ME-302

Paper ID : [A0819]

Time : 4 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

SECTION-A

1. **Write short notes on :**

(a) In case of flywheel the stress in rim is $\frac{3}{4}ft + \frac{1}{2}fb$. How do you consider flexibility of arms w.r.t. rim to calculate '*ft*' and '*fb*' ?

(b) Differentiate between L_{10} and L_{50} as applicable to rolling contact bearings.

(c) How do you ensure hydrodynamic lubrication in case of sliding contact bearings ?

(d) How do you designate chains and V-belts ?

(e) Differentiate between closed coil and open coil helical springs. Give one usage of each.

(f) Where do you find installed block, band and band and block brakes ?

(g) Name all the forces/loads that wire rope encounters in mine hoisting.

(h) We take average value of B.H.N. of gear pair in calculating wear load on gear/pinion teeth pair. Why ?

(i) In case of gears $\epsilon = \frac{\text{Arc of Action}}{p_c} > 1$. W

by this ?

(j) Name any two CAD softwares. Write very ve

SECTION-B

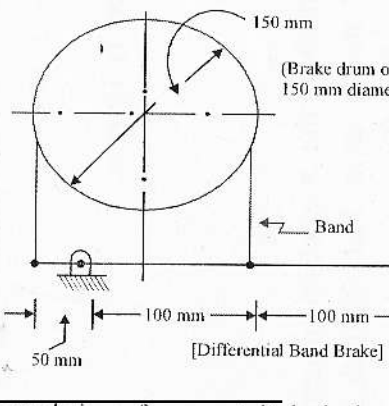
2. Design a helical spring for a spring loaded safet data :

Diameter of the valve seat = 65 mm; operating pressure when the valve blows off = 0.75 MPa; rises from 0.7 to 0.75 MPa = 3.5 mm. fs = 55 rigidity = 84 × 10^3 N/mm^2 for spring material. Sp

3. For differential brake shown in fig. Angle of la friction μ = 0.4 find :

(i) Max. and Minimum force in the band whe 450 Nm is applied to the drum.

(ii) The max. torque that the brake may sustai rotation of the drum.



[Differential Band Brake]

4. Discuss any design software w.r.t. its basic theo philosophy.

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5. Derive relations for stresses in the flywheel rim when

   (a) Arms are completely flexible.

   (b) Arms are completely rigid.

6. Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 r.p.m. for an average life of 5 years at 10 hours per day. Assume steady and uniform load.

SECTION-C

7. Give general design procedure for sliding contact bearings. (10)

8. Design a bevel gear drive between two shafts, whose axes are at right angle pinion speed = 240 r.p.m. gear speed = 120 r.p.m. No. of teeth on pinion = 21 with involute profile. Module = 20 mm; $\phi = 20°$. The material of gear may be cast iron and for pinion cast steel. P = 75 kW. Design gear shaft also. (10)

9. (a) Initial tension in case of flate belts (T_0) is $T_0 = \frac{T_1 + T_2 + 2T_C}{2}$. Derive this expression; symbols have their usual meaning. (03)

   (b) An overhung pulley transmits 35 kW at 240 r.p.m. The belt drive is vertical and angle of wrap = 180°. The distance of the pulley centre from the nearest bearing = 350 mm. $\mu = 0.25$. Determine :

   (i) Diameter of pulley

   (ii) Width of the belt when its thickness is 10 mm.

   (iii) Diameter of the shaft.

   (iv) Dimensions of the key.

   (v) Size of arms if they are six in number; the X-section of arm is elliptical with major axis = 2 × minor axis. For shaft & key material $ft = fc = 80$ MPa; $fs = 50$ MPa. For belt material $ft = 2.5$ MPa for pulley rim $ft = 4.5$ MPa; for pulley arms = 15 MPa. (07)