Total No. of Questions : 4]

SEAT No. :

PE70

[Total No. of Pages : 2

[6579]-372

T.E. (Mechanical/Mechanical S.W.) (Insem)

DESIGN OF MACHINE ELEMENTS

(2019 Pattern) (Semester - I) (302043)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Assume suitable data, if necessary.*

UNIT - I

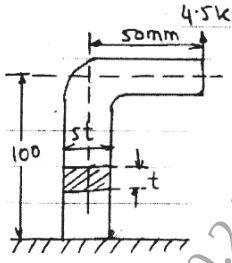
Q1) a) A knuckle joint is subjected to an axial load of 25 kN. It is made of plain carbon steel with yield strength in tension 760 MPa. Design the joint for FOS = 5. Take compression strength 20% more than tensile strength and shear strength is 0.577 of tensile strength. **[8]**

b) Define Factor of Safety and service factor? Explain the factors to be considered while selecting the factor of safety. **[7]**

OR

Q2) a) Design a right angled bell cranked lever. The horizontal arm is 500 mm long and a load of 4.5 kN acts vertically downwards. At the end of 150 mm long arm which is perpendicular to another arm, a force P acts at right angle to axis of 150 mm arm through a pin into a forked end. The lever consists of forged steel material and a pin at the fulcrum. **[10]**

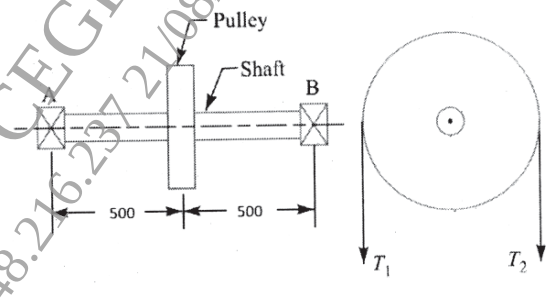
b) A column of uniform cross section is shown in following figure. If the permissible strength of the material is 70 MPa. Determine Dimensions of cross section. Also find direct and bending stress. **[5]**



P.T.O.

UNIT - II

Q3) a) A belt pulley is keyed to the shaft as shown in figure. Shaft transmits 20 kW at 400 rpm. Pulley diameter is 400 mm. Angle of wrap is 180°. Belt tension ratio 2.5 for shaft material $S_{ut} = 400 \frac{N}{mm^2}$, $S_{yt} = 240 \frac{N}{mm^2}$; Take K_m = 1.5, K_t = 1.25 permissible angle of twist is 0.25° per meter length. Design shaft on the basis of strength and rigidity. Take $= 80 \times 10^3 \frac{N}{mm^2}, E = 200 \times 10^3 \frac{N}{mm^2}$. **[8]**



b) Explain function of the key. What is the effect of keyways cut into the shaft? Explain the different types of Keys with neat diagrams. **[7]**

OR

Q4) a) Two 35 mm shafts are connected by a flange coupling. Flange are fitted by 6 bolts on PCD 125 mm shaft transmits torque 800 N - m at 350 rpm. Calculate **[10]**

i) Key dimensions;

ii) Hub length;

iii) Thickness of flange;

iv) Diameter of bolts;

v) Power transmitted. Assume bolts are fitted in large clearance holes. Take

For shaft, τ = 63 MPa; For key, τ = 46 MPa,

for bolt, τ = 56 MPa; for flange, τ = 10 MPa

b) Show that the Crushing stress induced in a square key is twice the shear stress. **[5]**

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