B.Tech Sem – V (2007 Course) (Mechanical Engg.) : SUMMER - 2019

SUBJECT: MACHINE DESIGN - I

Day : Saturday
Date : 11/05/2019

S-2019-3083

Time : 10.00 AM TO 02.00 PM
Max. Marks : 80

N.B.:

1) **Q. No. 1** and **Q. No. 5** are **COMPULSORY**. Out of remaining attempt **ANY TWO** questions from each section.
2) Figures to the right indicate full marks.
3) Answers to both the sections should be written in same answer books.
4) Use of non-programmable calculator is allowed.
5) Draw neat and labeled diagram wherever necessary.
6) Assume suitable data, if necessary.

SECTION - I

Q. 1 **a)** Explain design consideration before selecting a proper factor of safety. **(05)**

b) Sketch a protective flange coupling and indicate major dimensions in terms of shaft diameter d. **(05)**

c) What are the different stresses induced in power screws. **(04)**

Q. 2 **a)** Explain design procedure for cotter joint. **(08)**

b) What are the different types of standards in design? **(05)**

Q. 3 **a)** A steel shaft 50 mm diameter and 500 mm long is subjected to twisting moment of 1100 N-m the total angle of twist being 0.6^0 . Find maximum shear stress developed in the shaft and modulus of rigidity. **(07)**

b) Design a hollow shaft required to transmit 11.2 Mw at a speed of 300 rpm. The maximum shear stress allowed in the shaft is 80 MPa and ratio of inner diameter to outer diameter is ¾. **(06)**

Q. 4 A power screw having double started square threads of 25 mm nominal diameters and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of the screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 rpm. Assuming uniform wear conditions and allowable thread pressures 5.77 MPa **(13)**

Find :

i) Stresses in the screw

ii) Torque required to rotate screw

iii) Number of threads of nut in engagement with screw

P. T. O.

SECTION – II

Q. 5 **a)** What is nipping related to leaf spring? Comments on selection of material for manufacturing of leaf spring. **(05)**

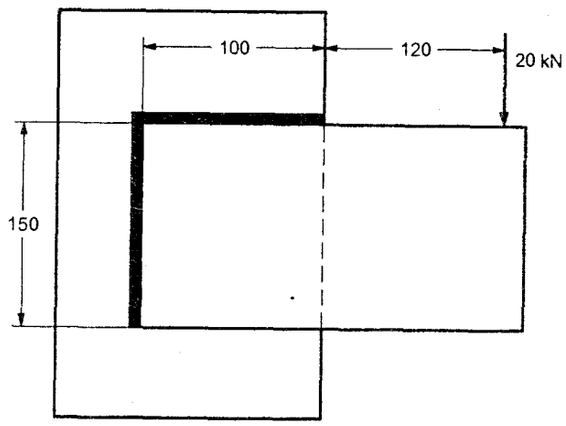
b) Explain the following terms in connection with machines parts loaded with fluctuating loads. **(05)**

i) Endurance Limit
ii) Size factor
iii) Surface finish factor
iv) Notch sensitivity

c) What are the advantages of welded joints compared with riveted joints? **(04)**

Q. 6 Design a helical compression spring for a maximum load of 1200 N for a deflection of 25 mm using the value of spring index as 5. Assume maximum permissible shear stress for spring material as 400 N/mm^2, modulus of rigidity can be assumed as 85 GN/m^2. **(13)**

Q. 7 Fig. shows a welded joint subjected to an eccentric load of 20 kN. The welding in only on one side. If the permissible shear stress for the weld material is 80 MPa determine the weld size. **(13)**



Q. 8 **a)** What are the causes of stress concentration? **(05)**

b) A steel bar of 50 mm diameter is subjected to a completely reversed bending stress of 250 N/mm^2. The ultimate tensile strength of steel is 600 N/mm^2. The surface finish factor and size factor are 0.43 and 0.85 respectively. The reliability factor is 0.897. Assuming there is no stress concentration. determine the life of the bar. **(08)**

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