

22564

12526

4 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Attempt any FIVE of the following :** **10**
- a) Define factor of safety and state formula of factor of safety for brittle material.
 - b) State four desirable properties of spring material.
 - c) State the requirement of good coupling.
 - d) State any four advantages of welded joints over screwed joint.
 - e) Define standardization.
 - f) State the application of taper roller bearing and deep groove ball bearing.
 - g) List the application of Knuckle joint.

P.T.O.

- 2. Attempt any THREE of the following :** **12**
- a) Draw stress - strain diagram for ductile material stating salient points.
 - b) Design a turn buckle subjected to a pull of 90 KN. The tie rod and nut are made of same material having permissible tensile stresses 75 N/mm^2 and shear stresses as 30 N/mm^2 .
 - c) State the difference between Shaft, Axle and spindle.
 - d) Write Lewis equation for strength of gear tooth. Give meaning of each term.
- 3. Attempt any THREE of the following :** **12**
- a) State and explain main consideration in machine design.
 - b) Define following terms of spring –
 - i) Solid length
 - ii) Free length
 - iii) Spring index
 - iv) Spring stiffness
 - c) State aesthetic consideration in design regarding colour.
 - d) Explain self locking and overhauling of screw.
 - e) Differentiate between cotter joint and knuckle joint. (Any four)
- 4. Attempt any TWO of the following :** **12**
- a) Explain the design procedure of hand lever with suitable sketch.
 - b) Define stress concentration. What are causes of stress concentration? Draw sketches of method of reducing stress concentration in cylindrical member with shoulders.
 - c) A mild steel shaft transmits 20 kW at 200 rpm. It carries a central load of 900 N and is simply supported on bearings 2.5 m apart. Determine size of shaft, if allowable shear stress is 42 MPa and Maximum tensile stresses is 56 MPa.

5. Attempt any TWO of the following :

12

- Design muff coupling which is used to connect two steel shaft transmitting 40 kW at 350 rpm. The material for shaft and key is plain carbon steel for which allowable shear stresses as 15 MPa.
- The lead screw of lathe has square threads of 24 mm outside diameter and 5 mm pitch. In order to drive the tool carriage of screw exerts an axial thrust 2.5 kN. Find the efficiency of screw of power required to drive the screw. Neglect the bearing friction and assume coefficient of friction as 0.12.
- Write down procedure for selection of bearing from manufacturer's catalogue.

6. Attempt any TWO of the following :

12

- A bracket as shown in Fig. No. 1 is fixed to the wall by means of four bolts. Find size of bolts if tensile stress as 70N/mm^2 for bolt material.

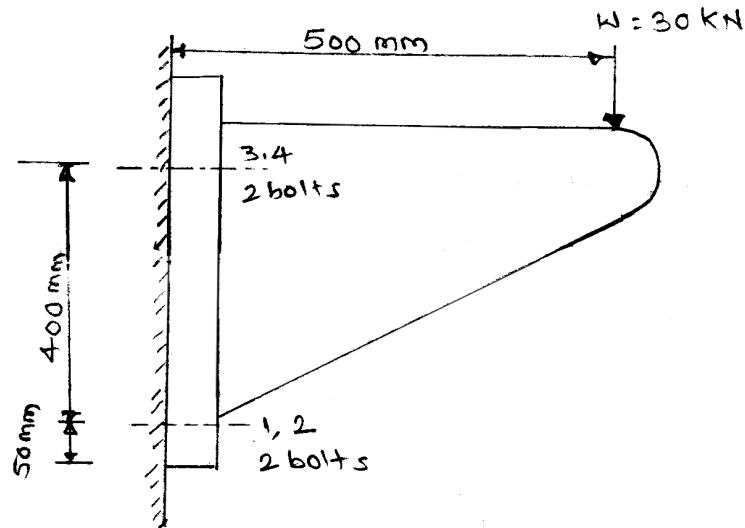


Fig. No. 1

22564

[4]

Marks

- b) Design a helical spring for spring loaded safety valve for the following conditions operating pressure $P_1 = 1 \text{ N/mm}^2$
Maximum pressure when valve is blowoff Freely -
 $P_2 = 1.075 \text{ N/mm}^2$. Maximum lift of valve when pressure is $1.075 \text{ N/mm}^2 = \delta = 6 \text{ mm}$
Diameter of valve seat = $D_v = 100 \text{ mm}$
Maximum shear stress = $\tau = 400 \text{ N/mm}^2$
Modulus of rigidity = $G = 86 \times 10^3 \text{ N/mm}^2$
Spring index = $C = 5.5$
- c) i) Why taper is provided on cotter ? What is its normal value.
ii) Draw the neat sketch of Leaf spring and name its parts.
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