**(REVISED COURSE)**

(4 Hours) **[Total Marks : 100**

N.B. : (1) Question No. 1 is **compulsory**.
  (2) Attempt any **four** questions from **remaining**.
  (3) Assume **suitable data**, if **required**.
  (4) Use of **standard data books** like PSG. Mahadevan is **permitted**.

1. Attempt any **five** from the following :— 20
   (a) State the various types of keys used for shafts for torque transmission and describe their special features.
   (b) What is the factor of safety ? What are the various factors to be considered while selecting the factor of safety ?
   (c) Write short notes on Asthetic consideration in design.
   (d) Write short notes on 'Soderberg Line'.
   (e) Explain the mechanism of fatique failure.
   (f) Write short notes on Preferred series and numbers.

2. A screw press is to be designed to exert an axial force of 30 kN.
   (a) Select suitable materials and design the nut and screw. Assume the height 10 of the screw press to be 250 mm.
   (b) Design the horizontal section of the frame if the axis of the screw is at a 10 distance of 250 mm from the inner edge of the frame. Give the reasons for the selection of material of the frame.

3. A shaft transmitting 30 kW at 400 rpm is supported in two bearing 650 mm apart 20 and carries two gears. A 25 teeth involute, 6 mm module gear is located 150 mm to the right of the left hand bearing and delivers power to gear located vertically above. A 70 teeth, 8 mm module gear is located 250 mm to the left of right hand bearing and receives power from a gear vertically above. The shaft rotates clockwise when viewed from right. Select suitable material for the shaft and design the shaft.

4. A protective type rigid flange coupling is required to transmit 25 kW at 250 rpm. 20 Select suitable material for the various components and design the coupling.

5. (a) Design socket and spigot type of cotter joint to transmit reversible load of 80 kN. 12 Select a suitable materials for the various parts.
   (b) Calculate the size of the weld required for an eccentrically loaded weld shown 8 in **figure** the allowable stress in weld is 75 N/mm^2.
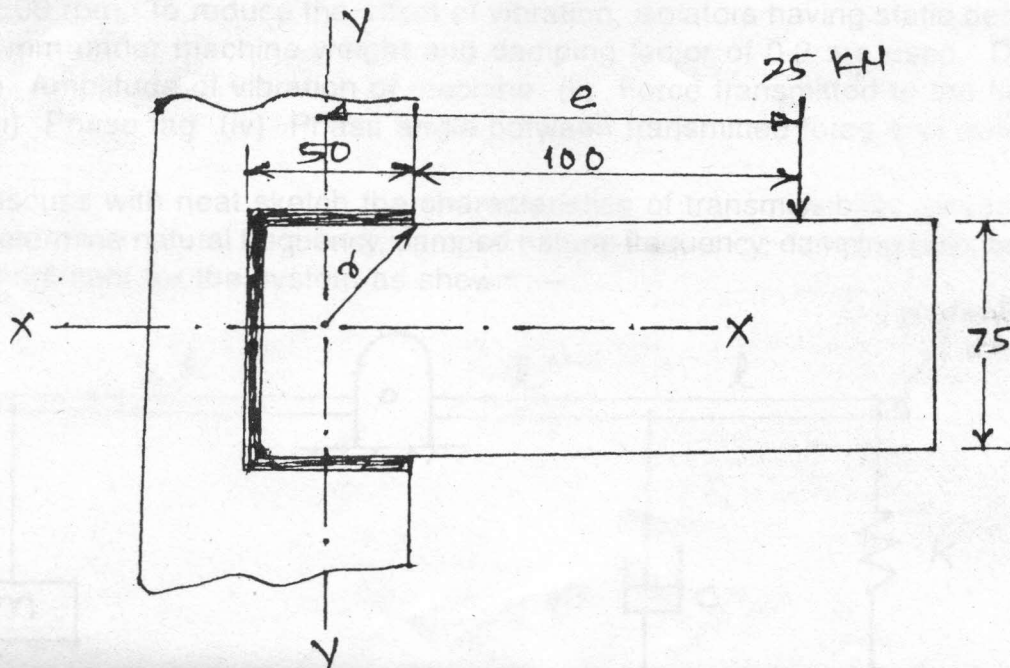
6. (a) A helical spring is subjected to the load varying from 500 N to 1100 N having **12**
          spring index of 6, free length of the spring is to be lie between 100 mm to 150 mm.
          The maximum compresion under the variation of load is 3 cm. Assume stresses
          for spring material and $G = 0.8 \times 10^5$ N/mm^2. Design the spring and find out
          energy stored in the spring.

    (b) The leaf spring has 12 numbers of leaves, two of which are full length of leaves. **8**
          The spring supports are 1·1 m apart and the central band is 90 mm wide. The
          central load is to be taken 5·5 kN with the permissible stress of 300 N/mm^2.
          Determine :—
          　(i) Thickness and width of the steel leaves
          　(ii) Deflection of the spring.
          Take the ratio of the total depth to the width of the spring as 3.

7. (a) Explain the chordal action of Chain drive. **5**

    (b) Design the flat belt drive to run the compressor having reduction ratio 3·15. **15**
          Input speed is 960 rpm and power to be transmitted 11 kW. Compressor runs
          to 10-12 hours per day. Expected life of the belt is 1 years. Also deside the
          shaft for pulleys, keys and driving and driven pulleys.

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