(3Hours)

[Total Marks: 80]

N.B. (1) Question no. 1 is compulsory
  (2) Answer any three question out of remaining questions.
  (3) Assume and state suitable data if necessary.
 (4) Use of PSG data book and Design data book of Mahadevan is permitted.

Q.l. Write Short notes on the following: 20

  (a) Factor of safety and its significance.
  (b) Failure modes and Efficiency of riveted joint.
  (c) Types of keys and application.
  (d) Types of welded joints and its application.
  (e) Spring index and its significance in helical spring

Q.2. (a) Design a knuckle joint to transmit 170 KN. Take suitable material and stresses 14
   for different parts of the joint.

  (b) A cast iron cylinder of internal diameter 190 mm and thickness 40 mm is 06
   subjected to pressure of 5 N/mm^2 .calculate the tangential and radial stress at
   the inner , middle and outer surface.

Q.3. (a) A steel solid shaft transmitting 15 KW at 200 rpm is supported on two bearings 15
   750 mm apart and has two gears keyed to it. The pinion having 30 teeth of
   Module 5mm is located 100 mm to the left of the right bearing and delivers
   power horizontally to the right. The gear having 100 teeth of module 5mm is
   located 150mm to the right of of the left hand bearing and receives power in a
   vertical direction from below. Select the suitable material and stresses determine
   the shaft diameter.

  (b) State advantages of welded joints 05

Q.4. (a) Design a cast iron protective type flange coupling to transmit 20 kw 10
   at 900 r.p.m. from an electric motor to compressor. Assume appropriate stresses
   for different components of the coupling.

  (b) Design a double riveted butt joint with two cover plates for the longitudinal 10
   seam for a boiler shell of 1.6 m diameter subjected to a steam pressure of
   0.95 N/mm^2 . Assume joint efficiency as 75% allowance tensile stress in the
   plate 90 MPa; compressive stress 150 MPa and shear stress in the rivet 56 MPa.

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Q.5. (a) Design s helical compression spring for a maximum load of 1000 N for a   10
deflection of 25 mm using the value of the spring index as5. The maximum
permissible shear stress for spring wire is 420MPa and modulus of rigidity is
84 KN/mm^2

(b) A bracket carrying a load of 15 kN is to be welded as shown in figure below   10
Find the size of the weld required if the allowable shear stress is not to exceed
80 MPa
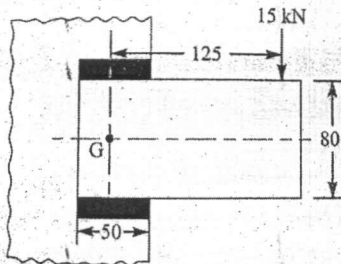
Q.6. (a) The frame of the punch press is shown in figure below. Find the stress at the   10
inner and outer surface at the section X-X of the frame, if W =5000 N.

Section at X-X
All dimensions in mm.
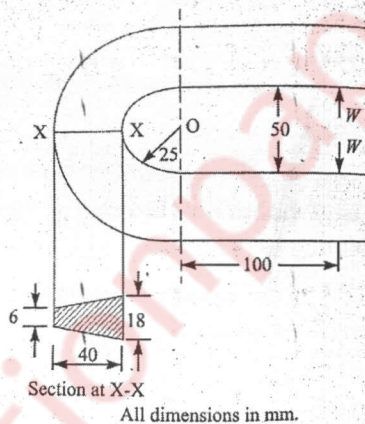
(b) A bracket, as shown below supports a load of 30 kN . Determine the size of   10
bolts if the maximum allowable tensile stress in the bolt material is 60 MPa.
The distance are L_1 = 80 mm, L_2 = 250 mm and L = 500 mm.

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