

MECH/CBGS/VI/MD-I | 29.11.2016

Machine Design - I

Q. P. Code : 601103

(3 Hours)



Marks:80

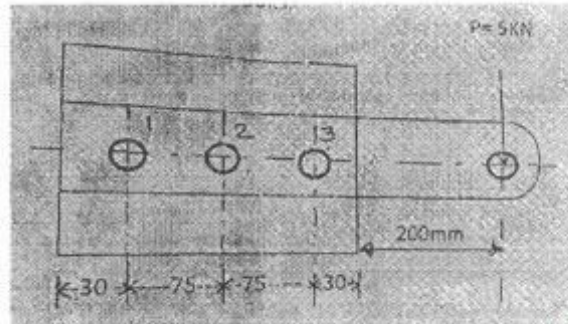
Instructions:

- i) Question No.1 is compulsory.
- ii) Solve any **three** questions from the remaining five questions.
- iii) Assume suitable data wherever necessary.
- iv) Figure to the right indicates full marks.
- v) Use of design data book is permitted.

- Q.1 Solve any **four** questions from following.
- a) What are the three different modes of failures of mechanical component? (05)
 - b) What is self locking and overhauling in screw jack? (05)
 - c) What are the assumptions made in design of weld joint? (05)
 - d) What are the different types of coupling? (05)
 - e) What are the different types of springs? What are their different materials? (05)
- Q.2 a) A knuckle joint subjected to an axial pull of 80 KN. Select suitable material and design and draw the joint. (16)
- b) What is cotter? Why taper is provided on the cotter? (04)
- Q.3 a) A C-clamp is subjected to a clamping force of 4 KN. Maximum distance between jaws is 30 mm. Distance between screw axis and frame axis is 100 mm. (16)
- i) Select appropriate materials and stresses for screw, nut and frame.
 - ii) Design screw and nut.
 - iii) Check screw for buckling failure.
 - iv) Determine dimensions of cross section of frame.
- b) Discuss on various types of threads used for power screw. (04)
- Q.4 a) Design a flexible coupling of pin bush type construction for connecting a reduction gear shaft to a stone crusher shaft. The unit is driven by 30 KW, 720 rpm motor through 5:1 reduction. Choose suitable material and their design stresses for the parts of coupling. (10)

[TURN OVER]

- b) A steel plate subjected to a force of 5 kN and fixed to a channel by means of three identical bolts, as shown. The bolts are made of plain carbon steel 45C8 and the factor of safety is 3. Find the size of the bolts. (10)



All dimensions are in mm

- Q.5 a) Design the hollow shaft from the strength and rigidity consideration with the following data (12)
- Power to be transmitted = 60 kW at 1440 r.p.m.
 - Ratio of inner to outer diameter = 0.5
 - Overhang = 250 mm
 - Bending load = 20 kN
 - Permissible angle of twist = 0.5°
- Select suitable material.
- b) What is stress concentration? What are the various causes of stress concentration? Discuss the various methods to reduce the effect of stress concentration. (08)
- Q.6 a) A helical compression spring is subjected to a load varying from zero to maximum of 9 kN, with corresponding deflection of 90 mm. Considering average service and spring steel having ultimate tensile strength $\sigma_u = 2000/d^{0.16}$ N/mm², where d is diameter of spring wire in mm and $G = 80000$ N/mm². Determine (12)
- Wire diameter and coil diameter.
 - Total numbers of coil
 - Free length, pitch and helix angle.
 - Check for solid stress.
- b) Explain neeping of the leaf spring with neat sketch. (04)
- c) Discuss the materials and practical applications for the various types of springs. (04)