

Kafrelsheikh University		Prof. Montasser Dewidar	
Faculty of Engineering		No. of Pages	: 2
Department of Mechanical Eng.		Date of Exam	: 24- 1 - 2019
Course Name : Stress Analysis		Time Allowed	: 3 Hours
Course Code: : MDP 2109		Full Mark	: 70 Degree
Level : 2			

Answer the following questions.

Question No. 1 Mark 15 This question identify ILOs a, b,c, and d

Two forces P_1 and P_2 , of magnitude $P_1 = 16$ KN and $P_2 = 20$ KN, are applied as shown to the end A of bar AB, which is welded to a cylindrical member BD of radius $c = 20$ mm (Fig. 1). Knowing that the distance from A to the axis of member BD is $a = 50$ mm and assuming that all stresses remain below the proportional limit of the material, evaluate (a) the normal and shearing stresses at point K of the transverse section of member BD located at a distance $b = 60$ mm from end B, (b) the principal axes and principal stresses at K, (c) the maximum shearing stress at K.

Question No. 2 Mark 10. This question identify ILOs a, b,c, and d

A shaft consisting of a steel tube of 50-mm outer diameter is to transmit 100 kW of power while rotating at a frequency of 20 Hz. Determine the tube thickness that should be used if the shearing stress is not to exceed 60 MPa.

Question No. 3 Mark 20. This question identify ILOs a, b,c, and d

- a- Determine the plastic moment M_p of a beam with the cross section shown in (Fig. 2 a) when the beam is bent about a horizontal axis. Assume that the material is elastoplastic with a yield strength of 240 MPa
- b- A 1600-lb.in. couple is applied to a wooden beam, of rectangular cross section 1.5 by 3.5 in., in a plane forming an angle of 30° with the vertical(Fig. 2b). Determine (a) the maximum stress in the beam, (b) the angle that the neutral surface forms with the horizontal plane.

Question No. 4 Mark 10. This question identify ILOs a, b,c, and d

The solid circular shaft in Fig. 3 is subject to belt pulls at each end and is simply supported at the two bearings. The material has a yield point of $36,000$ lb/in². Determine the required diameter of the shaft using the maximum shear stress theory and maximum principal stress theory together with a safety factor of 3.

Question No. 5 Mark 15. This question identify ILOs a, b,c, and d

- a- For the state of plane stress in Fig. 4(a) construct Mohr's circle, (b) determine the principal stresses, (c) determine the maximum shearing stress and the corresponding normal stress.
- b- A 2-m-long pin-ended column of square cross section is to be made of wood. Assuming $E = 13$ GPa, $\sigma_{all} = 12$ MPa, and using a factor of safety of 2.5 in computing Euler's critical load for buckling, determine the size of the cross section if the column is to safely support (a) a 100-kN load, (b) a 200-kN load.

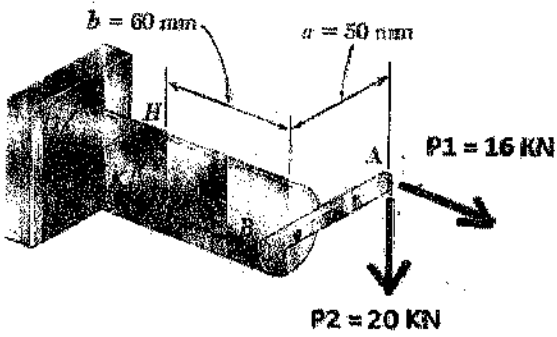


Fig. 1

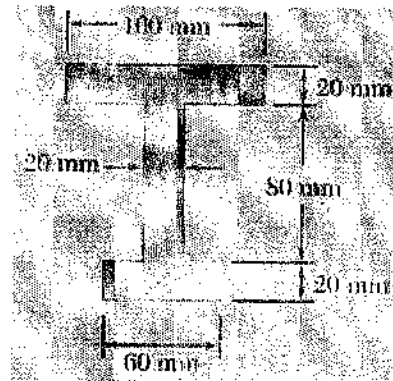


Fig. 2 a

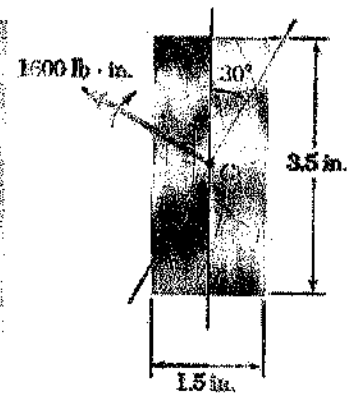


Fig. 2 b

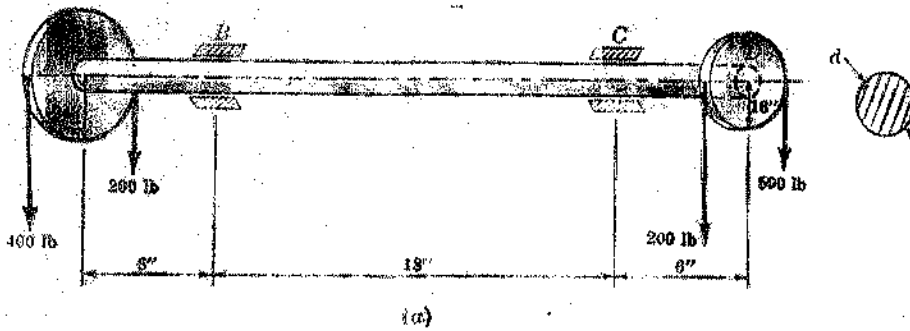


Fig. 3

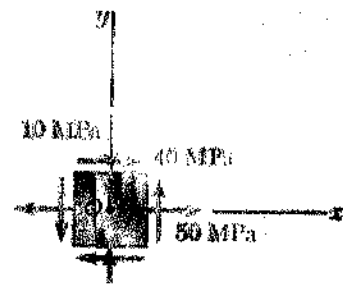


Fig. 3

“Good Luck”

Examining Committee

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