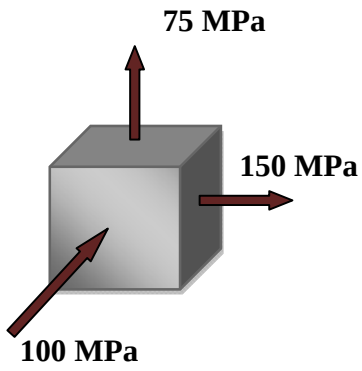
The Hashemite University
DEPARTMENT OF MECHANICAL ENGINEERING
Machine Elements Design

Part One (Closed Book) 28-10-2010

Student Name: Student No.:

Problem I. [7 points]

For the stressed element shown in the Figure; answer the followings



1-1. The principal stresses (σ_1, σ_2, σ_3) are

a. (150, 75, -100) MPa b. (150, 75, 100) MPa

c. (-150, -100, 75) MPa d. (150, -75, -100) MPa

1-2. The maximum shear stress using Mohr's circle technique is

a. 150 MPa b. 112.5 MPa c. 125 MPa d.37.5 MPa

1-3. The principal angle ϕ_p on the element is

a. 45^o b. 0.0^o c. 60^o d. 90^o

1-4. The maximum shear angle ϕ_s on the element is

a. 45^o b. 0.0^o c. 60^o d. 90^o

1-5. Circle the correct principal orientation corresponding to the stress state shown in Fig. 1.

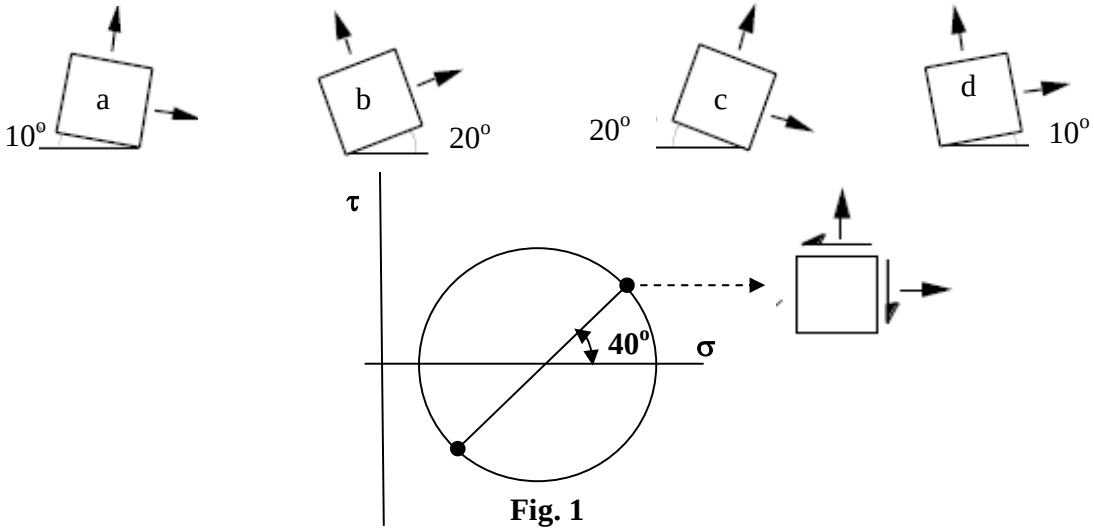


Fig. 1

1-6. The cold working process on a metals is carried out at a temperature

a. equal to the recrystallization temperature b. bellow the recrystallization temperature

c. above the recrystallization temperature d. all of the above are correct

1-7. The shearing strain due to temperature change is

a. $\alpha \Delta T$ b. $\alpha \Delta T/E$ c. zero d. $0.5\, \alpha \Delta T/E$

1-8. One of the following sentences is correct:

a. It is possible for a ductile material to have resilience greater than its toughness.

b. It is not possible for a ductile material to have resilience greater than its toughness.

c. It is possible for a ductile material to have resilience equal to its toughness.

d. None of the above is correct.

1-9. In static loading, stress concentration is more serious in

a. ductile material b. brittle material

c. elastic material d. brittle as well as ductile material

1-10. The design of the pressure vessel is based on

a. longitudinal stress b. hoop stress c. longitudinal and hoop stresses d. none of these

1-11. In an internally pressurized thin-walled cylinder, the longitudinal stress is …… of the circumferential stress

a. One-half b. two-third c. three-fourth d. none of these

1-12. In an internally pressurized thick-walled cylinder, the tangential stress across the thickness of the cylinder is

a. maximum at the outer surface and minimum at the inner surface
b. maximum at the inner surface and minimum at the outer surface
c. maximum at the inner surface and zero at the outer surface
d. maximum at the outer surface and zero at the inner surface

1-13. In an internally pressurized thick-walled cylinder, the maximum radial stress at the outer surface is

a. zero b. P c. $-P$ d. $2P$

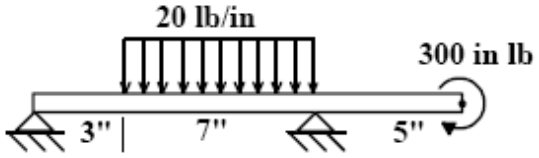
1-14. When the material is loaded within elastic limit, then the stress …… to the strain

a. equal b. directly proportional c. inversely proportional d. none of these

1-15. [3 Points]

For the beam shown in the Figure bellow

(i) Determine the values of the maximum shear force and maximum bending moment.
(ii) Drew the shear and moment diagrams.



$|V_{max}| =$ _____

$|M_{max}| =$ _____