Menoufiya University **Faculty of Engineering, Shebin El-Kom** **Production Engineering Department** **Date of Exam : 30 / 12 / 2017** **Academic year : 2017-2018**	جامعة المنوفية	**Subject: Test of Materials** **Code: PRE 505** **Year : Post Graduate Level 500** **Time Allowed : 3 hours** **Total Marks : 100 marks**

Answer the following questions

(Question 1): [20 Marks]

a- Chose the correct answer : (10 Marks)

1-If a material is subjected to two incremental true strains namely ε1and ε2, then the total true strain is _____

(a) ε1* ε2 (b) ε1- ε2 (c) ε1+ ε2 (d) ε1 / ε2

2-High elastic modulus in materials arises from _____

(a) High strength of bonds (b) Weak bonds (c) combination of bonds (d) None

3- According to distortion-energy criterion, yielding occurs when _____

(a) Distortion energy reaches a critical value

(b) Second invariant of the stress deviator exceeded some critical value

(c) Octahedral shear stress reaches a critical value

(d) All .

4-Time dependent yield is known as _____

(a) Fracture (b) Fatigue (c) Buckling (d) Creep

5-Most often machine components fail by

(a) Buckling (b) Creep (c) Fatigue (d) All

6- Failure due to excessive deformation is controlled by _____.

(a) Material properties (b) Design & Dimensions (c) Both (d) None

7-Brittle fracture is more dangerous than ductile fracture because _____.

(a) No warning sign (b) Crack propagates at very high speeds

(c) No need for extra stress during crack propagation (d) All

8-Fracturė toughness is measured in terms of _____

(a) Strain energy release rate (b) Stress concentration factor (c) Both (d) Non

9- von Mises and Tresca criteria give different yield stress for

(a) Uni-axial stress (b) Balanced bi-axial stress (c) Pure shear stress (d) All

10- Which of the following materials has the highest modulus of elasticity _____

(a) aluminum (b) diamond (c)steel (d)titanium (e) tungsten

b- Describe in detail the purpose and procedure for testing of metals for: (10 Marks)

(a) tensile strength b- impact strength

(Question 2): [20 marks]

a -What is meant by creep? Explain the different types of creep with the help of creep curve.? (6 Marks)

b-Mention the different methods of determining the hardness of a metal? (6 Marks)
State their advantages and disadvantages, Is there any relation between hardness and tensile strength?

c-Take two solid cylindrical specimens of equal diameter but different heights. Assume that both specimens are compressed (frictionless) by the same percent reduction, say 50%. Prove that the final diameters will be the same. (8 Marks)

(Question 3): [20 Marks]

a- Differentiate between the following: (12 Marks)

1- Fracture of mild steel and cast iron specimens in tensile testing.

2- Endurance limit and fatigue limit.

3- Ductility and malleability.

b- Estimate the depth of penetration in a Brinell hardness test using 500-kg load, when the sample is a cold-worked aluminum with a yield stress of 200 MPa (8 Marks)

(Question 4): [20 Marks]

a- Describe the effect of the following on fatigue (8 Marks)

(i) stress concentration on fatigue *(ii)* size

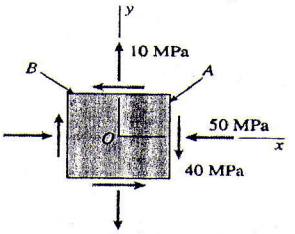
(iii) change of size of specimen and *(iv)* surface

b- τ_{xy}= - 40MPa as shown in the figure. Using Mohr's circle determine the following:

(a)Stresses acting on an element inclined at an angle $\theta = 45°$,

(b)The principal stresses and ,

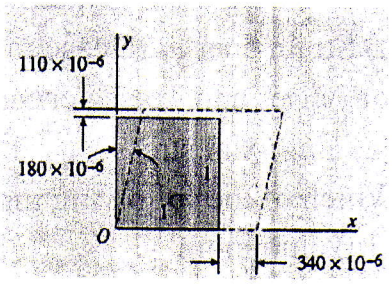
(c)The maximum shear stresses . (12 Marks)



(Question 5): [20 Marks]

a- Describe in detail the purpose and procedure for testing of metals for fatigue. (8 Marks)

b- Knowing that $\varepsilon_x = 340\times10^{-6}$ $\varepsilon_y = 110\times10^{-6}$
$\gamma_{xy} = 180\times100^{-6}$
Determine the strains for $\Theta=45°$, principal strains, maximum shear strain . (12 marks)



With our best wishes

This exam contributes "by measuring" in achieving Programme Academic Standards according to NARS															
Question Number	Q1,b	Q2-a,b	Q3-a	Q4,a	Q4,a	Q1-a	Q2-b,	Q3-b	Q4-b		Q1-	Q2-c	Q3-b	Q4 b	Q5 b
Skills	a1-1	a1-2	a1-1 a2-1	a2-1	a 1-1	b4-1	b5-1	b5-1	b4-1 b5-1			c2-1	c1-1	c1-1	c2-1
	Knowledge & Understanding Skills					Intellectual Skills					Professional Skills				