

Course No: ENGI 1220  
Course Title: Introduction of  
Materials Science  
Date: 25/05/2018  
No. of Questions: (4)  
Time: 2 hours  
Using Calculator (yes)

University of Palestine  
  
Final Exam  
2<sup>nd</sup> Semester 2017/2018  
Total Grade: 65

Instructor Name: Dr. Hossam ELAQRA,  
Student No.: \_\_\_\_\_  
Student Name: \_\_\_\_\_  
College Name: Engineering  
Dep. / Specialist: \_\_\_\_\_  
Using Dictionary (No)

**Question One:**

**16 marks**

Which of these sentences are true and which is false and correct the false one?

- 1- For the same material, larger section transfer more heat. ( )
- 2- Heat conduction occurs only due to the electron conduction. ( )
- 3- Thermal conductivity is stable for all materials as a function of temperature.( )
- 4- When materials are expose to positive change of temperature they contract. ( )
- 5- Heat expansion or contraction is controlled by the type of materials and the heat change. ( )
- 6- Materials with high thermal conductivity have lower specific heat. ( )
- 7- Thermal stress is negative when they are subjected to negative heat change. ( )
- 8- Ice and water can be present at 0°C. ( )
- 9- When hot water at 90°C is mixed with cooled water at 20°C the mix has the temperature of 15°C. ( )
- 10- Heat flow from low temperature to high temperature. ( )
- 11- Stress is defined as the ratio between the force and the area
- 12- Strain can be defined as the ratio between the elongation to the original length.
- 13- Glass transition temperature is the limit between solid state and liquid state.
- 14- Glass has a ductile behavior before glass transition temperature while it has brittle behavior after.
- 15- Thermoplastics polymers are hardened by heating while Thermosets polymers are soften by heating.
- 16- Poison ratio has always negative value.

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**Question Two:****19 marks**

Short answer:

1- Numerate 4 applications of ceramics.

A-

B-

C-

D-

2- Numerate 2 classifications of ceramics according to their chemistry.

A-

B-

3- Numerates 3 factors affect the cracks growth in the ceramic

A-

B-

C-

4- Numerate 2 factors affect the thermal conductivity in materials.

A-

B-

5- Numerate 2 factors affect the heat conduction.

A-

B-

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6- Elastic deformation, plastic deformation and recovery deformation  
(draw)?

**Question Three:**

**12 marks**

Long answer:

1- Discuss the effect of temperature on brittle and ductile materials. (2marks)

2- Discuss the differences between the failure in metals and ceramics. (4 marks)

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- 3- Discuss the effect of yield strength in materials design (its effect on creep and fatigue). (6 marks)

**Question Four:**

**18 marks**

- 1- Determine the final temperature results when 500g of ice at  $-10^{\circ}\text{C}$  is mixed with 150g of water at  $80^{\circ}\text{C}$ . Noted that heat needed to change ice to water or water to ice is  $80\text{cal/g}$  and  $c$  of water =  $1\text{ cal/g}$  and for ice =  $0,5\text{ cal/g}$ .(5 marks)

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2- A tensile force of 20N is applied along the axis of a Nylon cylinder ( $E = 1\text{GPa}$ , 1 m long, radius 0,01m) assume the deformation is elastic.

A- Calculate the elongation. (2 marks)

B- If the cylinder is broken at 35N calculate the apparent tensile strength and the true tensile strength if the broken radius is 0,006m. (4 marks)

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C- A steel cylinder of diameter 1cm at room temperature is to be slid into a hole in an Aluminum plate. The hole has a diameter of 0,997cm.  $\alpha=1.1*10^{-5}/^{\circ}\text{C}$  for steel and  $\alpha=1.7*10^{-5}/^{\circ}\text{C}$  for the Aluminum.

1- If you need to enter the cylinder in the hole, you will heat or cool them together? Why? (3 marks)

2- At what temperature must the cylinder start to inter into the hole. (3 marks)

End of Questions  
Good Luck