UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	MATERIAL TECHNOLGY AND SELECTION
COURSE CODE	:	BPC21903
PROGRAMME	:	4 BPB
EXAMINATION DATE	:	DECEMBER 2012 / JANUARY 2013
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 Nearly all composites materials consist of two phases, which are Primary and Secondary phase.

(a) Explain the purpose of each phases.

(4 marks)

(b) Design flexibility, corrosion resistance, low relative Investment and durability are the advantages of Composites Material.
Explain roughly about a design flexibility in composites.

(4 marks)

(c) State **FIVE (5)** basic types of composites material.

(5 marks)

(d) Name the process which is used in composites manufacturing shown in figure Q1(d).

(3 marks)

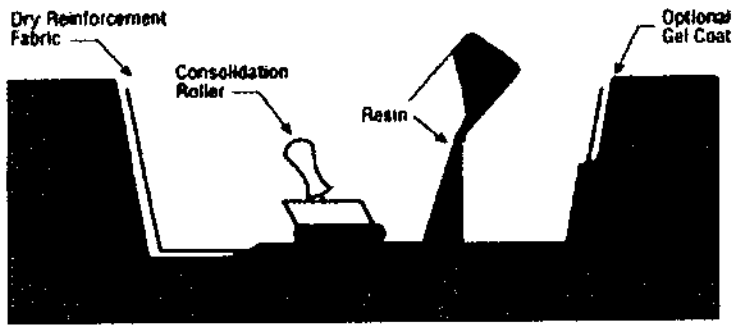

Figure Q1(d)

(e) Describe **TWO (2)** properties of Fiber Reinforce Polymer (FRPs), so that it is very significantly useful in aerospace industry.

(4 marks)

Q2 (a) Explain **THREE (3)** of mechanical properties which can be obtained from Mechanical Tesile Test.

(3 marks)

(b) State **ONE (1)** each of mechanical properties which can be obtained from Impact Test, Bending Test and Hardness Test.

(3 marks)

(c) The Tensile Test result of material of P, Q and R are shwon in figure Q2(c). Compare by rank the toughness of P,Q and R.

(3 marks)

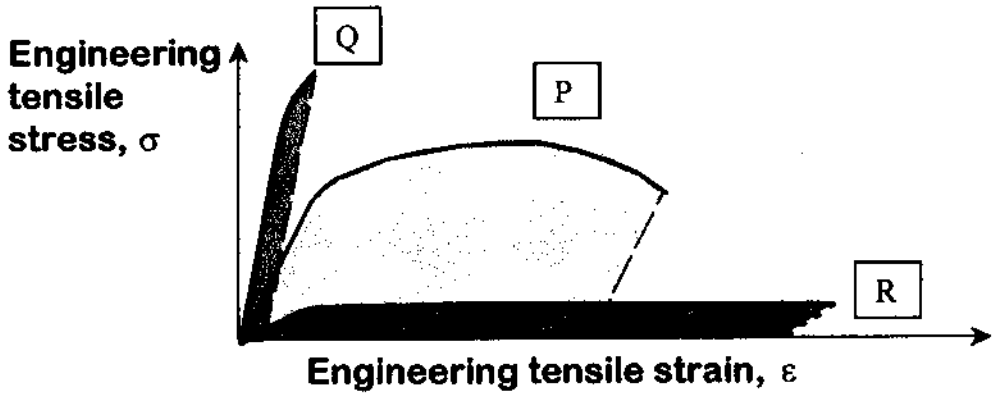

Figure Q2(c)

(d) Explain the reason of your answer in Q2(c).

(2 marks)

(e) Determine the stress (σ), if the 5kN force (F) applied to 10mm-diameter bar of 1040 carbon still.

(4 marks)

(f) The tensile test alone cannot predict the behavior of a structural material used at elevated temperatures.
Name the alternative test.

(2 marks)

(g) Name the mechanical test should be done to dertermine the failure subjected to a cyclic stress of a certain form, amplitude and the number of cycles.

(2 marks)

(h) Define the most important graph data in Q2(g) for engineering design to identify the endurance limit of materials.

(3 marks)

Q3 (a) Explain **THREE (3)** examples of Corrosion Measure.

(6 marks)

(b) Sketch with explanation the evolution to failure (fracture) of moderately ductile materials.

(6 marks)

(c) Differenciate the properties of material A, B and C when the behavior of fracture is shown in figure Q3(c).

(5 marks)

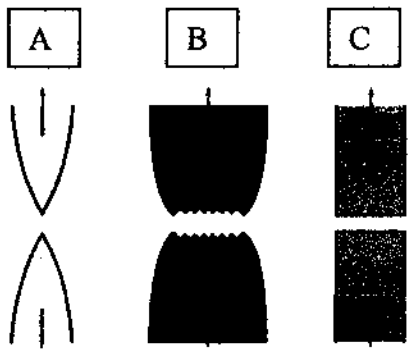

Figure Q3(c) : Fracture Behaviour

(d) List **THREE(3)** examples of the common Nondestructive Testing (NDT) Method.

(3 marks)

Q4 (a) Arrange in descending order of the material base on physical properties:

(i) Electrical Conductivity of Silver, Polystyrene,Silicon and Concrete.

(2 marks)

(ii) Density of Aluminium, Gold, Wood and Iron.

(2 marks)

(b) State **THREE(3)** of Classification of Magnetic Materials.

(3 marks)

(c) Differentiate each Classifications of your answer in Q4(b).

(3 marks)

(d) Explain the following;

(i) Heat Capacity.

(2 marks)

(ii) Thermal Conductivity.

(2 marks)

(iii) Thermal Shock Resistance.

(2 marks)

Q5 Most a products need to satisfy some performance targets, which is determined by considering the design specification e.g. they must be cheap, or stiff, or strong, or light when to be manufactured. Each of these performance requirements will influence which materials should be choosen. (i.e. bicycle frame making).

(a) List out **THREE (3)** materials which can be considered for bicycle frame making.

(6 marks)

(b) Select **ONE (1)** of the best material in your consideration.

(2 marks)

(c) Explain the reason on your selection in Q5(b).

(8 marks)

Q6 (a) Explain the following:

(i) Nanotechnology

(2 marks)

(ii) Top-Down Nanofabrication

(2 marks)

(b) State **FOUR (4)** applications of Nanotechnology.

(4 marks)

- END OF QUESTION -