Menoufiya University **Faculty of Engineering** **Shebin El- Kom** **Final Term Exam.** **Academic Year: 2017 – 2018** **Date: 3/ 1/ 2018**	**Dept. : Production Engineering** **Year :** 500 دراسات- دبلوم مستوى **Subject: Composite Materials** **Code : PRE 504** **Time Allowed: 3 hours** **Total Marks: 100 Marks**
Allowed Tables and Charts: None	

Answer all the following Questions:

Question 1: **(25 marks)**

a) Demonstrate how you can make products by mixing plastics waste with sawdust indicating the basic processing steps for manufacturing wood plastic composites. (12 marks)

b) Compare between plastic wood composite sheets extrusion process and pultrusion process used to fabricate solid and hollow structures with constant cross sections. (5 marks)

c) Explain the main tests that must be carried out for the judgment on the quality of WPC products. (8 marks)

Question 2: **(25 marks)**

a) List the factors that must be considered for fabricating MMCs to obtain castings with high quality and good properties. (5 marks)

b) Describe Liquid Metallurgy / Vortex Technique indicating why it is essential to control the temperature. (10 marks)

c) Explain why is wetting of the fibers important and mention some treatments that are required for the reinforcement and melt to promote wetting. (5 marks)

d) A metal-matrix composite (MMC) is made of a 2024-Al alloy matrix and continuous boron fibers. The boron fibers are produced with a 11.5-μm-diameter tungsten-wire core which is coated with boron to make a final 105-μm-diameter fiber. A unidirectional composite is made with 51 vol % of the boron fibers in the Al 2024 matrix. Assuming the law of mixtures applies to isostrain conditions, calculate the tensile modulus of the composite in the direction of the fibers. Given: E_B = 379 GPa, E_W = 410 GPa, and E_{Al} = 724 GPa. (5 marks)

Question 3: **(25 marks)**

a) Demonstrate that the primary concept for designing a mechanical part made from composite materials differ from those made from isotropic materials indicating the main characteristic properties that must be considered during design. (7 marks)

b) For isotropic materials, write down about the common criteria used for brittle materials and that for ductile materials. (8 marks)

c) Explain how you can apply the Hill-Tsai failure criterion for composite materials and why the difference. (10 marks)

Question 4: **(25 marks)**

a) Describe one open-mold method for producing pipes and pressure vessels, and one close-mold method used in the automotive industry indicating the advantages of both. (12 marks)

b) Define the types of structural composites, the construction of sandwich panels indicating the functions of each phase. (7 marks)

c) Demonstrate the concept of making hybrid composites and their advantages. (6 marks)

Good Luck

This exam contributes "by measuring ILOs" in achieving Programme Academic Standards according to NARS															
Question Number	Q1-b Q1-c	Q2-a Q2-c,d	Q3-b Q3-c	Q4-a Q4-b,c				Q3-c			Q1-a	Q2-b	Q3-a	-	
	a3-1,2	a3-1,2	a19-2	a3-1				b2-1,			c5-1	c1-1	c5-1		
Skills	Knowledge & Understanding Skills					Intellectual Skills					Professional Skills				