

**CONFIDENTIAL**



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2020/2021**

COURSE NAME : MATERIAL ENGINEERING  
TECHNOLOGY

COURSE CODE : BDX 10703

PROGRAMME CODE : BDX

EXAMINATION DATE : JULY 2021

DURATION : 3 HOURS

INSTRUCTION : ANSWERS **FIVE (5)** QUESTIONS  
**ONLY**

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

**CONFIDENTIAL**

**TERBUKA**

- Q1** (a) What are the different between materials science and materials engineering? (6 marks)
- (b) Aluminium is a popular aerospace structural material although it has several disadvantages. List FOUR (4) disadvantages of using aluminium alloys in the aircraft structures. (6 marks)
- (c) Materials affect virtually on the structural components and engines of the aircraft.
- (i) State TWO (2) suitable materials that were needed in aircraft manufacturing. (2 marks)
- (ii) Provide a justification to your answer in (c) (i). (6 marks)
- Q2** (a) State the main groups of materials used in aerospace structures? (4 marks)
- (b) The fuselage is a long cylindrical shell, closed at its ends, which carries the internal payload. The dominant type of fuselage structure is semimonocoque construction. Explain briefly about the properties of material to produce the fuselage structure and suggest ONE (1) suitable material to product the fuselage. (8 marks)
- (c) By referring to the **Figure Q2(c)**;
- (i) What can you conclude from the figure in terms of the composite used and year of service? (4 marks)
- (ii) Correlate the explanation in c (i) with the properties of the material showed in **Figure Q2(c)**. (4 marks)
- Q3** (a) Identify FOUR (4) properties of the materials to be used in the aircraft structures. (4 marks)
- (b) Most metals at room temperature are found in one of three crystalline patterns: Body Centred Cubic (BCC), Face Centred Cubic (FCC) or Hexagonal Close Packed (HCP).

- (i) Draw THREE (3) crystalline pattern. (10 marks)
- (ii) State the properties for every crystalline pattern (3 marks)
- (iii) Give an example of metal for every crystalline pattern (3 marks)
- Q4** (a) Point defects are localized disruptions in an otherwise perfect arrangement of atoms in a crystal lattice structure. Explain THREE (3) main types of point defects found in metals. (9 marks)
- (b) What is the suitable test to measure plastic deformation for materials? (3 marks)
- (c) Titanium alloys are used in airframe structures, landing gear components and jet engine parts for their unique combination of properties. Explain in detail about advantages and disadvantages of these materials. (8 marks)
- Q5** (a) What are shape-memory alloys? (4 marks)
- (b) Determine the importance of Fracture test to the materials used in aircraft structures? (6 marks)
- (c) The biggest obstacle to the use of magnesium alloys is their poor corrosion resistance. Magnesium occupies one of the highest anodic positions in the galvanic series, and for this reason has a high potential for corrosion.
- (i) Give TWO (2) solutions to solve the corrosion problem for Magnesium. (4 marks)
- (ii) Explain briefly the properties that can be achieved from the solution in (c) i. (6 marks)

**Q6** (a) Explain the different between mild steel and stainless steel.

(6 marks)

(b) The microstructure and mechanical properties of the hypoeutectic steels used in aircraft structures is controlled by heat-treatment as well as the carbon and alloy contents.

(i) Relate the heat treatment with the changes of the steel properties.

(6 marks)

(ii) Interpret the effect of carbon to the strength of steel in term of different temperature that be used in heat treatment.

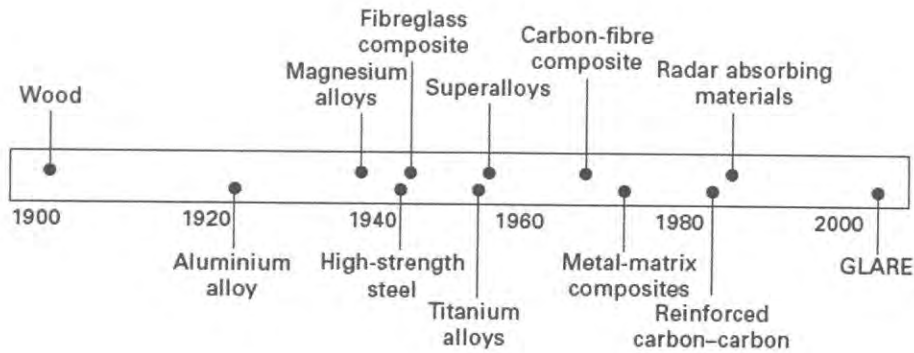
(8 marks)

**-END OF QUESTIONS -**

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2020/2021  
COURSE NAME: MATERIAL ENGINEERING  
TECHNOLOGY

PROGRAMME CODE : BDX  
COURSE CODE : BDX 10703



Historical timeline indicating the approximate year when the main types of materials were first used in aircraft.

Figure Q2(c)