Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	MANUFACTURING PROCESS
COURSE CODE	:	BEH 41303
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JUNE/JULY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Final products made by the manufacturing industries can be divided into two major classes which are consumer and capital goods. Explain and give examples of these classes.

(4 marks)

(b) Most engineering materials can be classified into one of four categories. List **three (3)** examples of the material and classify their categories.

(6 marks)

(c) As a design engineer in Mineral Glass Corporation, your task is to design a new generation of glass which will be used in Casio G-Shock. In the specification report of your new glass product, you are supposed to include measuring gauge used to determine the surface roughness of the glass. Justify your answer by including the gauge used and the process

(6 marks)

(d) Plastic or polymer products exist in everyday life. Establish the relationship of viscosity and temperature of plastic with referring to **Figure Q1(d)**.

(4 marks)

Q2 (a) In a Brinell hardness test, a 1250 kg load is pressed into a specimen using a 1.2 cm diameter hardened steel ball. The resulting indentation has a diameter = 3.4 mm. Determine the Brinell hardness number for the metal.

(2 marks)

Hint:

$$HB = \frac{2F}{\pi D_b (D_b - \sqrt{D_b^2 - D_i^2})}$$

(b) A copper wire of diameter 0.75 mm fails at an engineering stress = 235.4 N/mm^2. Its ductility is measured as 85% reduction of area.

(i) Calculate the true stress at failure.

(3 marks)

(ii) Calculate the true strain at failure.

(3 marks)

(c) A test specimen in a tensile test has a gauge length of 65 mm and an area = 275 mm^2. During the test the specimen yields under a load of 55,000 N. The corresponding gage length = 65.23 mm. The maximum load of 125,000 N is reached at a gauge length = 75.2 mm.

(i) Calculate modulus of elasticity

(5 marks)

(ii) If fracture occurs at a gauge length of 78.4 mm, calculate the percent elongation.

(2 marks)

(iii) If the specimen necked to an area = 126.5 mm^2, calculate the percent reduction in area.

(2 marks)

Formula:

$$strain, e = \frac{h-h_o}{h_o} \qquad stress, \sigma_e = -\frac{F}{A} \qquad shortening, s = \frac{h_s-h_o}{h_o}$$

$$Hooke's\ Law, \sigma_e = Ee$$

$$where, E = modulus\ of\ elasticity$$

(d) Analyse the car sport rim as shown in **Figure Q2(d)** and point out the manufacturing processes involved in producing it.

(3 marks)

Q3 (a) In the casting of steel under certain mold conditions, the mold constant in Chvorinov's rule is known to be 4.0 min/cm^2, based on previous experience. The casting is a flat plate whose length = 30 cm, width = 10 cm, and thickness = 20 mm. Calculate how long it will take for the casting to solidify.

(6 marks)

(b) A problem with the surface roughness, R_a computation is that waviness may get included. With the aid of diagram, point out your idea how to deal with this problem.

(6 marks)

(c) The foreman in the injection molding department says that a PVC part produced in one of the operations has greater shrinkage than the calculations indicate it should have. The important dimension of the part is specified as 74.3 ±0.43 mm. However, the actual molded part measures 74.75 mm.

(i) Suggest a new material which can be produced within the required tolerance to replace PVC by referring to **Table Q3(c)(i)**.

(4 marks)

(ii) If the company decided to fix with the PVC, point out **two (2)** adjustments in process parameters could be made to reduce the amount of shrinkage.

(4 marks)

Q4 (a) What manufacturing process would you suggest to a car manufacture for producing car bumpers? Suggest **two (2)** manufacturing process.

(4 marks)

(b) The technique of thermoforming is used to produce food tray as illustrated in **Figure Q4(b).** With the aid of a diagram, construct the working operation of thermal forming food trays.

(6 marks)

(c) State the differences between deep drawing and bar drawing by including related figures and propose which process is suitable for metal screws production.

(6 marks)

(d) As a project engineer, you are required to propose an enhance machining system in the factory. The proposal should discuss how to avoid chatter (vibration) during the turning operation. Point out your idea.

(4 marks)

Q5 (a) In a turning operation on stainless steel with hardness – 175 HB, the cutting speed – 175 m/min, feed = 0.15 mm/rev, and depth of cut = 7.5 mm. The energy value, F_c = 2.35 Nm/mm^3.

(i) Calculate the metal removal rate.

(3 marks)

(ii) Calculate how much power will the lathe draw in performing this operation if it's mechanical efficiency = 85%.

(4 marks)

(Hint: $R_{MR} = vfd$*)*

(b) A 5.2 kW heat source transfers heat to the surface of a metal part. The heat affects the surface in a circular area, with intensities varying inside the circle.

(i) Calculate the percentage of power transferred within a circle of diameter, d = 4 mm when the power density in this region is 86.43 W/mm^2.

(4 marks)

(ii) Calculate the percentage of power transferred within a concentric circle of diameter, d = 8 mm when the power density in this region is 17.45 W/mm^2.

(4 marks)

(c) List the **two (2)** aspects of quality in a manufactured product.

(2 marks)

(d) State **three (3)** problems encountered when 100% inspection is done manually.

(3 marks)

-END OF QUESTIONS –

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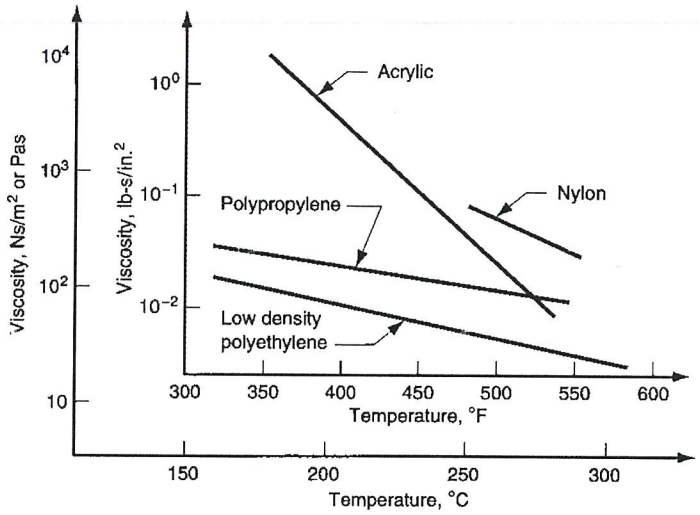

Figure Q1(d)

Figure Q2(d)

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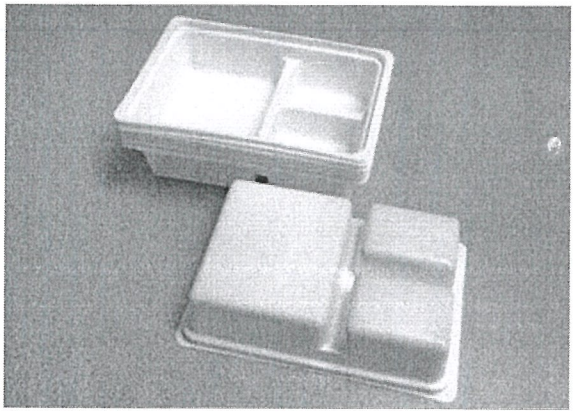

Figure Q4(b)

TABLE Q3(c)(i): Typical Values of Shrinkage for Moldings of Selected Thermoplastics.

Plastic	Shrinkage, mm/mm (in/in)
ABS	0.006
Nylon-6,6	0.020
Polycarbonate	0.007
Polyethylene	0.025
Polystyrene	0.004
PVC	0.005