Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	MANUFACTURING PROCESS
COURSE CODE	:	BEH 41303
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	DECEMBER 2018/JANUARY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) Manufacturing industries can be classified as primary, secondary and tertiary industries. Explain these classifications together with examples.

(6 marks)

(b) Product variety and production quantity are related when comparing typical factories. Point out the relationship.

(4 marks)

(c) State the differences between a shaping process and a surface processing operation together with example of product and machine used in 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 1500 kg load is pressed into a specimen using a 1.0 mm diameter hardened steel ball. The resulting indentation has a diameter = 3.2 cm. 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 fails tensile test at an engineering stress, $\sigma_e = 225$ N/mm^2 and true stress $\sigma = 1500$ N/mm^2.

(i) Calculate the percentage of area reduction, A_r.

(4 marks)

(ii) Calculate the true strain at failure, ε.

(4 marks)

(c) A compression test uses a test specimen that has an initial height of 65 mm and an area of 275 mm^2. During the test the specimen yields under a load of 55,000 N and the corresponding gauge length is measured at 64.77 mm.

(i) Calculate modulus of elasticity

(4 marks)

(ii) If the test stop at a gauge height of 63.50 mm, calculate the percentage of area enlargement.

(3 marks)

Formula:

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

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

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

(d) Analyse the DC Motor Coupling as shown in **Figure Q2(d)** and point out the manufacturing processes involved in producing it.

(3 marks)

Q3 (a) A disk-shaped part is to be cast out of aluminium. The diameter of the disk = 500 mm and its thickness = 20 mm. If the mold constant = 2.0 s/mm^2 in Chvorinov's rule, calculate the time taken 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 105.50 ±0.50 mm. However, the actual molded part measures 104.90 mm.

(i) Point out **two (2)** adjustments in process parameters could be made to reduce the amount of shrinkage.

(4 marks)

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

(4 marks)

Q4 (a) What manufacturing process would you suggest to a car manufacturer for producing car door panels (outer part)? Propose **two (2)** manufacturing process.

(4 marks)

(b) Various kind of manufacturing techniques are used to produce gas cylinder as illustrated in **Figure Q4(b).** With the aid of diagrams, justify related manufacturing techniques involved in producing gas cylinder.

(6 marks)

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

(6 marks)

(d) As a project engineer, you are required to propose an enhance CNC machining system in the factory. The proposal should discuss how to avoid end tool failure during the milling operation of aluminum sheet. Point out your idea.

(4 marks)

Q5 (a) In a turning operation on stainless steel with hardness = 200 HB, the cutting speed = 200 m/min, feed = 0.25 mm/rev, and depth of cut = 7.5 mm. The energy value, F_c = 2.8 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 = 90%.

(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) Explain 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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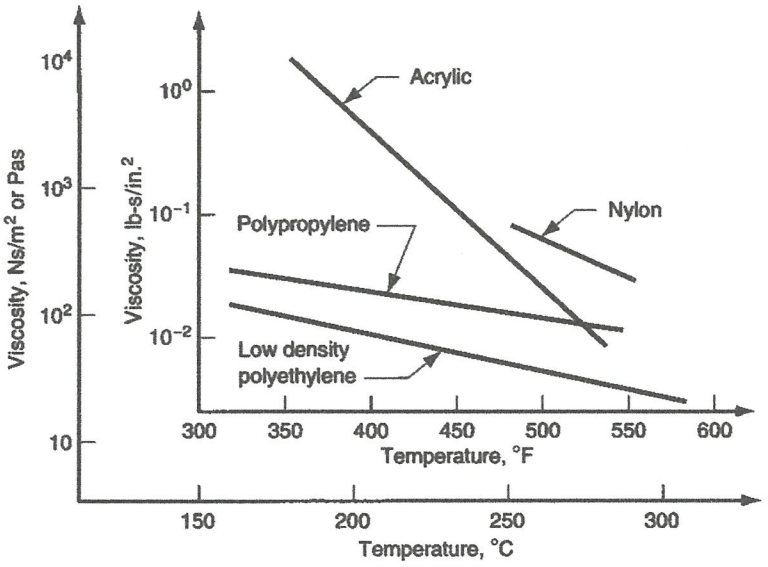

Figure Q1(d)

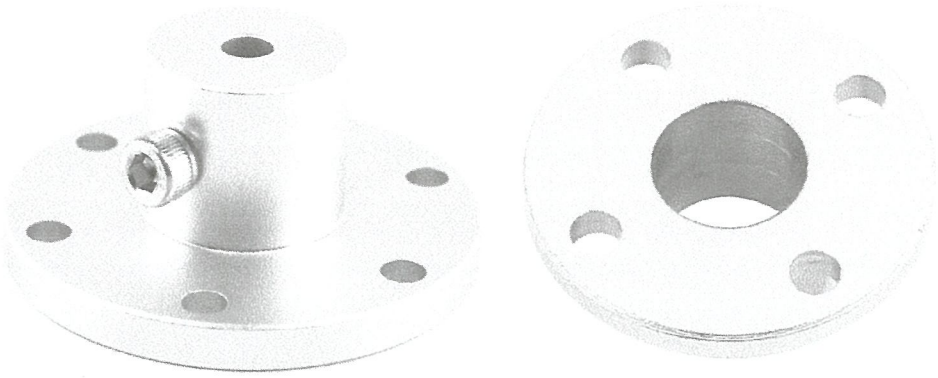

Figure Q2(d)

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TABLE Q3(c)(ii)

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

Figure Q4(b)