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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017**

TERBUKA

COURSE NAME : MANUFACTURING PROCESS
COURSE CODE : BEH 41303
PROGRAMME CODE : BEJ
EXAMINATION DATE : JUNE 2017
DURATION : 3 HOURS
INSTRUCTION : ANSWER **ALL** QUESTIONS

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

- Q1**
- (a) Manufacturing industries can be classified as primary, secondary and tertiary industries. Explain these classifications together with examples. (6 marks)
 - (b) Most engineering materials can be classified into one of four categories. List two examples of the material and classify their categories. (4 marks)
 - (c) In manufacturing processes, state the differences between a processing operation and an assembly operation together with the examples. (4 marks)
 - (d) In engineering materials, it is appropriate to divide polymers into three categories which are thermoplastic, thermosetting and elastomers. Differentiate between thermoplastic and elastomer polymers. (6 marks)
- Q2**
- (a) As a design engineer in Gorilla Glass Corporation, your task is to design a new generation of glass which will be used in smart phones. 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)
 - (b) A tensile test uses a test specimen that has a gauge length of 70 mm and an area of 240 mm². During the test the specimen yields under a load of 98 kN and the corresponding gauge length is measured at 70.25 mm. The maximum load of 16.8 kN is reached at a gauge length of 74.2 mm.
 - (i) Determine yield strength. (3 marks)
 - (ii) Determine modulus of elasticity, E. (6 marks)
 - (iii) If fracture occurs at a gauge length of 77.3 mm, calculate the percentage of elongation. (3 marks)
 - (iv) With the aid of a diagram, highlight properly the stress-strain curve of the specimen. (2 marks)

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- Q3**
- (a) Explain dimension and the tolerance of a fabrication part together with two example of equipment to measure dimension and tolerance. (4 marks)
- (b) In the casting of steel process under certain mold conditions, the mold constant in Chvorinov's rule is known to be 4.0 min/cm^2 . The casting is a flat plate are as follows: length = 30 cm, width = 10 cm, and thickness = 20 mm. Determine how long it will take for the casting to solidify. (6 marks)
- (c) As a production engineer, produce a monthly report to discuss two defects that can occur in sand casting process by including related figures. (4 marks)
- (d) The technique of thermal forming is used to produce instant noodle cup as illustrated in **Figure Q3(d)**. With the aid of a diagram, construct the working operation of thermal forming instant noodle cup. (6 marks)
- Q4**
- (a) As a product designer in the production of car bumper using 100 tone injection molding, you are require to design a new model of car bumper. You need to keep in mind the general considerations when designing components out of plastics. Point out your ideas. (4 marks)
- (b) The foreman in the injection molding department says that a polyethylene 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 $112.5 \pm 0.25 \text{ mm}$. However, the actual molded part measures 112.02 mm.
- (i) As a first step, the corresponding mold cavity dimension should be checked. Calculate the correct value of the mold dimension, given that the shrinkage value for polyethylene is 0.025. (4 marks)
- (ii) Point out the adjustments in process parameters that could be made to reduce the amount of shrinkage. (4 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. (8 marks)



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- Q5 (a) A cylindrical workpart 200 mm in diameter and 700 mm long is to be turned in an engine lathe. Cutting speed = 2.30 m/s, feed = 0.32 mm/rev, and depth of cut = 1.80 mm.
- (i) Determine the cutting time of the workpart. (2 marks)
- (ii) Determine the metal removal rate of the workpart. (2 marks)
- (Hint: $T_m = \frac{\pi D_0 L}{fv}$ $R_{MR} = vfd$)
- (b) As a project engineer, you are required to propose new machining system in the factory. The proposal should discuss the importance and operation of machining in industries, together with the proposed lathe machine general structure and its operation. (7 marks)
- (c) A 4.6 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. The distribution is as follow: 60% of the power is transferred within a circle of diameter, $d = 6$ mm, 80% is transferred within a concentric circle of diameter, $d = 10$ mm. Calculate the power densities in:
- (i) The 6 mm diameter, d inner circle. (2 marks)
- (ii) The 10 mm diameter, d ring that lies around the inner circle. (2 marks)
- (d) Modern inspection technologies include contact and non-contact sensing devices. List three example of modern inspection devices and explain two of the devices. (5 marks)

-END OF QUESTIONS -

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Figure Q3 (d)

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