First Semester Examination
Academic Session 2018/2019

December 2018/January 2019

EPP201 – Manufacturing Technology I
[Teknologi Pembuatan 1]

Duration : 3 hours
Masa : 3 jam

Please check that this examination paper consists of SEVEN [7] printed pages before you begin the examination.

[Sila pastikan bahawa kertas soalan ini mengandungi TUJUH [7] mukasurat bercetak sebelum anda memulakan peperiksaan.]

INSTRUCTIONS : Answer **ALL FIVE [5]** questions.
***[ARAHAN** : Jawab **SEMUA LIMA [5]** soalan.]*

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai.]

…2/-

1. [a] Draw a stress-strain curve and discuss the behavior of a metal part under increasing load. What is the effect of temperature to the deformation behavior?

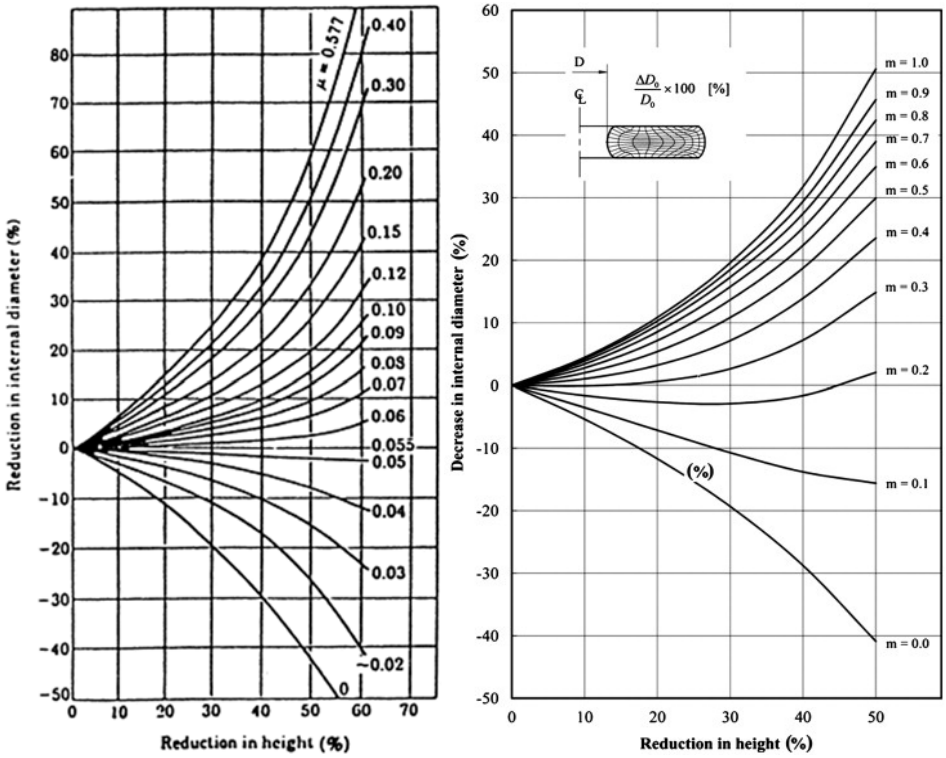
Lukis lengkung tegasan-terikan dan bincangkan sifat bahagian logam di bawah beban yang meningkat. Apakah kesan suhu kepada sifat ubah-bentuk.

(60 marks/*markah)*

[b] In the ring compression test, a specimen 10 mm high with outside and inside diameters (OD and ID) of 30 mm and 15 mm, respectively. The height reduced by 50%. Use Table 1 to determine the coefficient of friction, *μ,* and the friction factor, *m*, if the ID after deformation is 7.5 mm.

Dalam ujian himpitan gelung, spesimen dengan tinggi 10 mm dan mempunyai diameter luaran dan dalaman (OD dan ID) 30 mm dan 15 mm masing-masing. Ketinggian dikurangkan sebanyak 50%. Gunakan Jadual 1 untuk menentukan pekali geseran, μ, dan faktor geseran, m jika ID selepas perubahan bentuk adalah 7.5 mm.

Table 1
Jadual 1



(40 marks/*markah)*

…3/-

2. **[a]** **List the major classes of casting molds and describe them briefly.**
Senaraikan pengkelasan utama acuan dan terangkan secara ringkas.

(20 marks/*markah*)

[b] **Describe centrifugal casting process.**
Gambarkan proses pengacuanan centrifugal.

(10 marks/*markah*)

[c] **Define die casting processes and classify TWO(2) types of them.**
Definisikan proses-proses dai pengacuanan dan kelaskan DUA(2) jenis daripadanya.

(10 marks/*markah*)

[d] **Propose any FOUR(4) design considerations in casting process.**
Cadangkan mana EMPAT(4) pertimbangan-pertimbangan reka bentuk dalam proses pengacuanan.

(30 marks/*markah*)

[e] **Assume you are designing a model of a cast part, label the features in Figure 1[e].**

Andaikan anda sedang mereka bentuk satu model beracuan, labelkan bahagian-bahagian dalam Rajah 1[e].

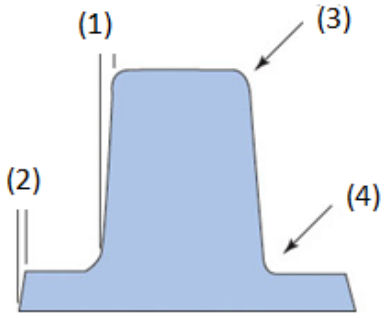


Figure *1[e]*
Rajah 1[e]

(30 marks/*markah*)

3. Abrasive machining is also known as material removal process
Pemesinan lelasan juga dikenali sebagai proses membuang bahan.

[a] Explain abrasive machining operation based on Figure 3[a] and label A, B, C, D, d, α, φ.

Terangkan proses pemesinan lelasan berdasarkan Rajah 3[a] dan labelkan A, B, C, D, d, α, φ.

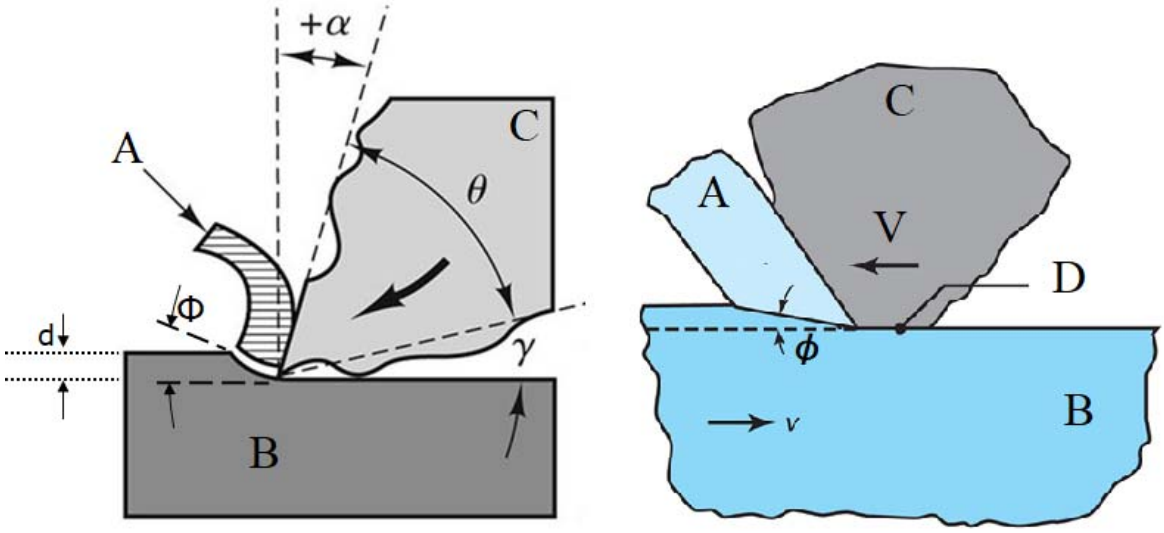


Figure 3[a]
Rajah 3[a]

(35 marks/*markah*)

[b] During a turning operation, a work piece is being cut at V = 100 m/min. The machining power is found to be 3 kW. The feed is 0.2 mm/rev, and depth of cut is 0.5 mm. The bar is machined to a diameter of 50 mm and its length is 250 mm. Calculate the followings:

Semasa operasi pelarikan, benda kerja dipotong pada kelajuan V = 100 m/min. Kuasa pemesinan adalah 3 kW. Suapan ialah 0.2 mm/rev, dan kedalaman pemotongan ialah 0.5 mm. Bar ini dimesin kepada diameter 50 mm dan panjang 250 mm. Kirakan yang berikut:

$$V = \pi D_{avg}\,[\text{mm}]^{*}\, N\,[\text{rev/min}]\,;\, u_t\ \left[\frac{\text{N}}{mm^2}\right] \text{or} \left[\text{W}\cdot\frac{\text{s}}{\text{mm3}}\right] = \frac{\text{Power}}{\text{MRR}}$$

$$Torque = \frac{Power}{\omega} \text{ or} = F_c \cdot D_{avg}/2 \ \ ; \ \ t = \frac{l}{fN}$$

…5/-

(i) What is the material removal rate in mm^3/s?
Berapakah kadar pembuangan bahan dalam unit mm^3/s?

(**10 marks**/*markah)*

(ii) What is the initial bar diameter?
Apakah diameter asal bar?

(5 marks/*markah)*

(iii) What is the rotational speed of the work piece in rev/min?
Berapakah kelajuan pusingan benda kerja dalam unit rev/min?

(5 marks/*markah)*

(iv) What is the feed rate in $mm/\min$?
Berapakah kadar suapan dalam $mm/\min$?

(5 marks/*markah)*

(v) What is the main cutting force in Newtons?
Berapakah daya pemotongan dalam unit Newtons?

(10 marks/*markah)*

(vi) What is the specific cutting energy in both N/mm^2 and $W \cdot s/mm^3$?

Berapakah tenaga pemotongan spesifik dalam kedua-dua unit N/mm^2 dan $W \cdot s/mm^3$?

(10 marks/*markah)*

(vii) What is the torque on the spindle in $N \cdot m$?
Berapakah tork pengumpar dalam unit $N \cdot m$?

(10 marks/*markah)*

(viii) Estimate the necessary machining time.
Anggarkan masa pemesinan yang diperlukan.

(10 marks/*markah)*

4. [a] For the given products in Figure 4[a], describe the step involve in manufacturing of the product using any metal forming processes.

Bagi produk-produk dalam Rajah 4[a], jelaskan langkah-langkah yang terlibat dalam pembuatan produk menggunakan mana-mana proses pembentukkan logam.

(50 marks/*markah)*

…6/-

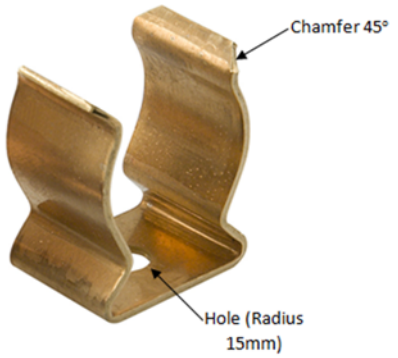
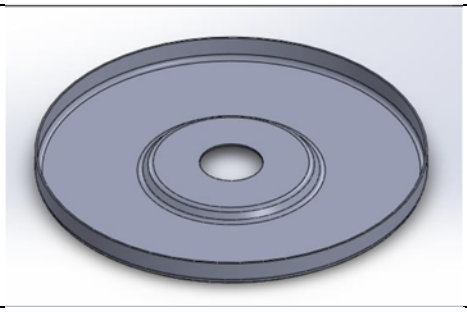
(i)		(Copper Fuse Holder)
(ii)		(Oil filter endcap)
(iii)		(Socket Head Screw)

Figure 4[a]
Rajah 4[a]

[b] **For any TWO(2) of the products in Figure 4[a], what is the most suitable die type that can be used to produce the part by taking into consideration the complexity of the parts and volume produced.**

Bagi mana-mana DUA(2) produk dalam Rajah 4[a], apakah jenis dai yang paling bersesuaian untuk digunakan dengan mengambilkira pertimbangan kerumitan dan bilangan produk yang dihasilkan.

(10 marks*/markah***)**

…7/-

[c] Understanding a forming-limit diagram (FLD) is important in determining formability of a material before proceeding for a manufacturing process. With the aid of sketches, describe the FLD and the elements in the diagram.

Pemahaman rajah had-pembentukan (FLD) adalah penting dalam menentukan keboleh-bentukan sesuatu bahan sebelum diteruskan dengan proses pembuatan. Dengan bantuan lakaran, terangkan FLD dan elemen-elemen yang ada dalam rajah ini.

(40 marks/*markah)*

5. [a] State any THREE(3) strategies in weight reduction of an automotive part design and manufacture

Nyatakan mana-mana TIGA(3) strategi untuk mengurangkan berat reka bentuk dan pembuatan komponen otomotif

(**15 marks**/*markah*)

[b] Tailored blanks are semi-finished parts, which are typically made from sheets with different alloys, thicknesses, coatings or material properties. After joining, these will be subjected to various metal forming processes such as deep drawing or stamping to produce finish parts. With aid of sketches, describe any THREE(3) tailor blank types.

"Tailored blanks" adalah bahagian separa-siap, yang lazimnya diperbuat daripada kepingan berlainan aloi, ketebalan, saduran atau sifat bahan. Selepas disambung, ia akan dibentuk menggunakan pelbagai proses tempaan logam seperti tarikan dalam dan pembentukan untuk menghasilkan produk akhir. Dengan bantuan lakaran, terangkan mana-mana TIGA(3) jenis "tailored blanks".

(60 marks/*markah*)

[c] Describe any TWO(2) welding methods in preparing the tailor blanks.

Terangkan mana-mana DUA(2) kaedah kimpalan dalam menyediakan "tailored blanks".

(**25 marks**/*markah*)

- oooOooo -