MENOUFIYA UNIVERSITY **Faculty of Engineering** **Tim Allowed: 3 hour** **Second Semester Examination, 2014 -2015** **Date of Exam: 24/ 5 /2014**	جامعة المنوفية كلية الهندسة - شبين الكوم	**Dept. of Prod. Eng.& Design** **First year** **Forming Processes** **Code: PRE 121** **Total mark: 90 marks**

Answer all the following questions استعن بالرسم كلما امكن ذلك

QUESTION NO. 1 **(18 Mark)**

A) Write short notes about the following;

- Permeability - Pouring temperature - Sand hardness.

B) Explain with neat sketch the vacuum casting process and list its advantages.

C) What are the factors which are responsible for the selection of furnaces? Explain with neat sketch the furnace which used for melting the ferrous metals.

D) In casting experiments performed using a certain alloy and type of sand mold; it took 160 sec for a cube shaped casting to solidify. The cube was 45 mm on a side. (i) Determine the value B of the mold constant in Chvorinov's Rule. (ii) If the same alloy and mold type were used, find the total solidification time TST for a cylindrical casting in which the diameter r = 18 mm and length h = 55 mm.

QUESTION NO. 2 **(18 Mark)**

A) Explain with neat sketch the mechanism of solidification of alloys and shows the cooling curve.

B) Determine the weigh of the metal required for completing the casting process of low carbon steel pulley shown in Fig.1. Estimate the rate of pouring and draw the suitable die for casting the steel pulley. Take specific weight of melted carbon steel (7.50 grme/cm^3), carbon steel (7.89 grame/cm^3) and the coefficient of friction is 0.38. Take the machining allowances of casting (6 mm for upper surface, 5 mm for normal surface and 6 mm for internal diameter) and the pouring factor S = 0.80.

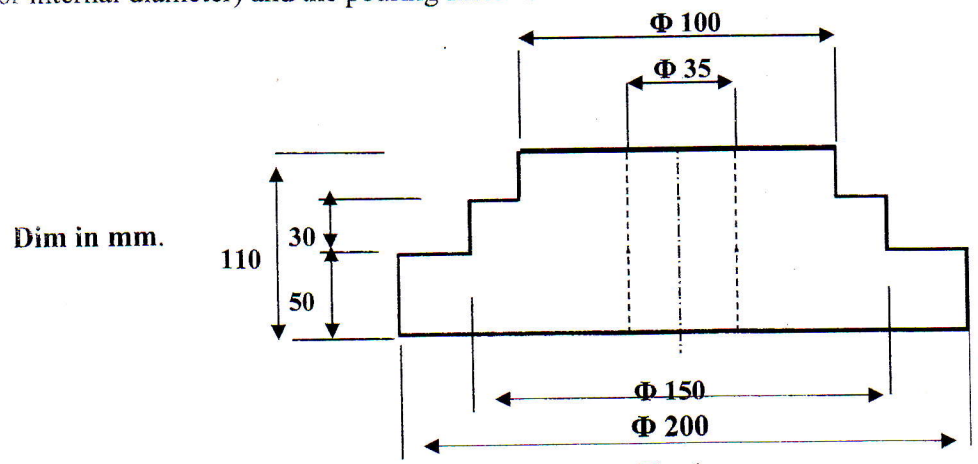

Fig. 1

C) Differentiate with neat sketch between the following:-

- Swaging and upsetting forging - Shear and tube spinning

D) Discuss with neat sketch why in the coining process, the lubrication is not used?

QUESTION NO. 3 **(18 Mark)**

A) Carbon steel cylindrical workpieces have 100 mm diameter and 300 mm height. The final height after hammering by using the impression drop die forging is 100 mm at temperature 1200 °C. The flow stress is 80 MPa and the coefficient of friction is 0.4. Calculate the hammering force to perform this process and heating conditions with drawing the heating curve. Take the number of pieces B=2.

B) Describe with a neat sketches shearing operations in a sheet metal work. Show with neat sketch only how to produce the flat washer by using the multi-stage dies.

C) Discuss briefly the advantages and limitations of the powder metallurgy method.

D) Describe briefly the production steps involved in making powder metallurgy parts.

QUESTION NO.4 **(18 Mark)**

A) Why in the rolling production line of steel, the forming processes start hot then cold?

B) Derive the required relation between the contact angle and the friction condition in the rolling process.

C) Explain with neat sketch the defects which happen due to roll bending during flat rolling process.

D) Calculate the roll force, torque and power required to **hot roll** a plate from alloy steel of width 200 mm and thickness of 15 mm to a thickness of 13 mm in one stage. Rolls have diameter of 400 mm and rotate with N=50 rpm. Take C=230 MPa, m=0.3 and μ=0.4.

QUESTION NO. 5 **(18 Mark)**

A) Explain with neat sketch the different types of extrusion process.

B) Why is there density variation in the compacting of the powder? How is it reduced?

C) Explain the defects which happen during extrusion process.

D) Calculate the extrusion force and power required to extrude a cylindrical bar from Aluminum alloy 5052 (K= 210 MPa and n= 0.15) of length 150 mm and diameter of 100 mm to diameter of 50 mm in one stage. The extrusion process is performed at speed of 50 mm/sec.

********** GOOD LUCK************

This exam measures the following ILOs															
Question number	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
skills	A1	A3	A3	A1	A2	B2	B2	B4	B2	B4	C1	C1	C3	C3	C3
	Knowledge & Understanding					Intellectual					Professional				

Prof. Dr. / Mahmoud Abo-Elkhier & *Dr.* / Mahmoud Samir El-Wazery