TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY EXAMINATION FOR:
BSc. Mechanical Engineering
EMG 2402 : MATERIAL FORMING PROCESSES 1
END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2016
TIME: 2 HOURS
DATE: Pick Date **Dec 2016**

Instruction to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt any **THREE** questions.
Maximum marks for each part of a question are as shown.
Do not write on the question paper.

Question ONE

a) (i) Outline the importance of providing for shear on press tools.

(ii)Explain the condition that determines whether shear is to be provided in the punch or die from the point of view of product quality (4½ marks)

(b)A 70mm square aperture is to be produced on a steel strip of 4mm thick. The shear stress of the material is 470N/mm^2 and penetration occurs at one quarter of the thickness. If the maximum punch force is to be reduced to one third, and assuming single shear on the punch, calculate:

(i)Amount of shear required(mm)
(ii)Angle of shear (5½ marks)

(c) A cup of final diameter 100mm and height 300mm is to be deep drawn on a press tool. The blank is 3mm thick and the tensile stress is 420 N/mm^2. If the reductions of 43%, 32% and R% are to be made, determine:

(i) Blank size
(ii) Final % reduction R
(iii) Maximum drawing force (10 marks)

Question TWO

a) Describe:

i) Extrusion of hollow shapes using spider mandrel

ii) Impact extrusion (7 marks)

b) A copper billet 140mm diameter and 260mm long is extruded at 815^{o} C at a speed of 250mm/s. Using square dies and assuming poor lubrication, estimate the force required in this operation if the final diameter is 50mm. (Take C=131MPa, m=0.06) (6 marks)

c) A 350mm wide 6061-T6 aluminium strip is rolled from a thickness of 24mm to 19mm. If the roll radius is 310mm and roll r.p.m is 112, estimate the total horsepower required for the operation. (Take K=410 MPa, n=0.05) (7 marks)

Question THREE

Describe:

i. Laminated Sheet
ii. Filament winding
iii. Transfer moulding, and
iv. Rotational moulding *(20 marks*

Question FOUR

a) What are the SIX activities that are conducted on almost every manufactured product? (3 marks)

b) Describe:

i. Pattern
ii. Flask
iii. Core
iv. Mould cavity
v. Riser (5 marks)

c) A solid cylindrical ceramic part is to be made whose final length is to be l_f=35mm. It has been established that for this material, linear shrinkage during drying and firing are 6% and 9% respectively based on the dried dimension L_d. Calculate:

(i) Initial length L_o of the part.

(ii) The dried porosity P_d if the porosity of the fired part P_f is 4%. (6 marks)

d) Using Chvorinov's rule with n=2, calculate the dimensions of an effective riser for a casting that is 50mmx100mmx150mm rectangular plate. Assume that the casting and riser are not connected, except through a gate and runner, and that the riser is a cylinder of height/diameter ratio H/D=1.5. (6 *marks*

Question FIVE

Describe:

a) InvestmentCentrifugal casting
b) Shell moulding
c) Hot chamber die casting
d) Slush casting *(20 marks*