



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMM 315: MATERIAL FORMING PROCESSES

DATE: 26/7/2019

TIME: 11.00-1.00 PM

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (30 MARKS)

- a) List any **FOUR** cold working processes considered in metal forming. (2 marks)
- b) Using a neat sketch, explain the principle and mechanism of metal rolling processes. (3 marks)
- c) Enumerate **FOUR** advantages of hot working in metal forming. (4 marks)
- d) List and explain **SIX** sheet metal forming operations. (6 marks)
- e) Briefly explain any **FOUR** methods that can be used for joining plastics. (4 marks)
- f) Using neat sketches, explain the basic steps of green sand moulding. (8 marks)
- g) Enumerate **THREE** design considerations for ceramics. (3 marks)

QUESTION TWO (20 MARKS)

- a) Differentiate between 'temporary mould' and 'permanent mould' (2 marks)
- b) Using neat sketches explain briefly about the following patterns;
 - i) Solid pattern
 - ii) Cope and drag pattern. (4 marks)
- c) Explain the causes and methods of mitigating the following defects in casting (8 marks)
 - i) Blow holes

- ii) Cold shut
 - iii) Mismatch
 - iv) Swell
- d) In a sand casting process, the following parameters are proposed; Height of sprue (h) = 25mm, cross-sectional area at sprue base = 4 cm^2 , Volume of cavity = 1850 cm^3 . Calculate the following pouring parameters: (6 marks)
- i) Velocity of molten metal,
 - ii) Volumetric flow rate
 - iii) Time required to fill mould cavity

QUESTION THREE (20 MARKS)

- a) State **FOUR** advantages of forging as applied in metal forming process. (4 marks)
- b) Differentiate between tube drawing and tube making (by rotary piercing) using neat sketches. (6 marks)
- c) Using neat sketches explain the operation of progressive and combination dies used in press work applications. (6 marks)
- d) A washer with 12.7 mm internal hole and an outside diameter of 25.4 mm is to be made from 0.2% carbon steel 1.5 mm thick. Considering the elastic recovery of the material, find (a) clearance (b) blank die opening size (c) the piercing punch size, (e) the piercing die-opening size. Assume a clearance of 5% of blank thickness for soft steel and 0.005mm allowance for blank expansion and elastic recovery. (4 marks)

QUESTION FOUR (20 MARKS)

- a) Sketch and explain **FOUR** configurations of rolling process. (4 marks)
- b) Briefly explain **THREE** defects in metal forging. (3 marks)
- c) List **SIX** advantages of ceramic materials. (3 marks)
- d) List **TWO** classifications of ceramics giving **TWO** examples in each case. (2 marks)
- e) Enumerate **FOUR** constituents of glass and **TWO** functions in each case. (8 marks)

QUESTION FIVE (20 MARKS)

- a) Enumerate **SIX** differences between thermosetting and thermoplastic materials. (6 marks)
- b) Using neat sketches differentiate between the following types of blow molding (7 marks)
 - i) Extrusion Blow Molding
 - ii) Injection Blow Molding
- c) Briefly describe **SEVEN** characteristics/properties of plastics. (7 marks)