EGERTON UNIVERSITY

UNIVERSITY EXAMINATIONS
NJORO CAMPUS

ACADEMIC YEAR 2013/2014
SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

MENT 230 - MANUFACTURING ENGINEERING I

STREAM: Y2 (MENT)   **TIME: 2 HRS**

DAY: FRIDAY, 8.30 – 11.30AM   **DATE:** 17/01/14

INSTRUCTIONS: This paper contains FIVE questions.
Each question carries 25 marks.
Attempt any FOUR questions.

1. (a) Briefly explain the following processes and state their applications.
    i)   Electroslag welding
    ii)   Friction welding
    iii)   MIG   welding
    iv)   Brazing

                                                                   (8 marks)

    (b) Explain the various turning operations.   (3 marks)

    (c) A 300 mm long, 30 mm diameter steel rod is reduced in diameter to 10 mm by turning on a lathe. The spindle rotates at 600 RPM while axial travel of the tool is 300 mm/min. Note material power rate is 300 Watt. Seconds/mm^3

    Calculate
    i)   Cutting speed
    ii)   Material removal rate
    iii)   Cutting time

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      iv)   Power dissipated

      v)   Cutting forces

                                                  (13 marks)

2. (a) Discuss the various types of forging with specific examples and illustrations in each.

                                                  (9 marks)

    (b) In slab milling, 450 mm long, 100 mm wide annealed steel block is cut at feed of 0.5 mm/tooth and depth of cut of 5 mm. the cutter diameter is 75 mm and has 25 straight teeth. It rotates at 530 rpm. Note material power rate is 650 Watt. Seconds/mm^3

    Calculate:

      i)   Material removal rate

      ii)   Power required

      iii)   Torque

                                                  (10 marks)

    (c) Explain the various types of turning operations.   (6 marks)

3. (a) A power hammer of mass 5 tones descends on a work piece at a velocity of 10 m/s. The hammer has a cross sectional area of 650 cm^2 and height of drop is 6 m from the work piece. If the ram is driven by means of compressed air at a pressure of 10 bars, calculate the energy supplied to the blow.   (7 marks)

    (b) Derive an expression for material removal rate in turning.   (6 marks)

    (c) Discuss the process of investment casting with illustrations.   (12 marks)

4. (a) Discuss the main steps in casting process.   (5 marks)

    (b) Outline the main features of the following casting processes with the aid of diagrams

      i)   Sand casting.   (5 marks)

      ii)   Die casting.   (5 marks)

(c) Explain the following: (4 marks)

    i)   Casting
    ii)   Mould
    iii)   Cope
    iv)   Flash

(d) Derive the expression for material removal rate in face milling. (6 marks)

5. (a) Illustrate and explain the following forging processes. (6 marks)

    i)   Fullering
    ii)   Swaging
    iii)   Closed die forging.

(b) Illustrate and explain the various parts of the gating system in metal casting.
(5 marks)

(c) Explain any three finishing operations in powder metallurgy. (3 marks)

(d) A jeweler wishes to produce 24 gold rings in one investment-casing operations, the wax parts are attached to a wax central sprue 12 mm in diameter. The rings are located in four rows, each 12 mm from the other on the sprue. The rings require a 3-mm diameter, 12-mm-long runner to the sprue. Estimate the weight of gold needed to completely fill the rings, runners, and sprues. The specific gravity of gold is 19.3. Approximate a typical ring as a tube with dimensions of 25 mm outer diameter, 16 mm inner diameter and 10 mm width. Assume no gold remains pouring basing. (11 marks)

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