



MURANG'A UNIVERSITY COLLEGE (MRUC)
(A Constituent College of Jomo Kenyatta University of Agriculture & Technology)

UNIVERSITY EXAMINATIONS 2013

FIRST YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS
AND COMPUTER SCIENCE & BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

SMA 2104: MATHEMATICS FOR SCIENCES

DATE: 11 DECEMBER 2013

TIME: 2 HOURS

INSTRUCTIONS:

ANSWER QUESTION **ONE**(COMPULSORY) AND ANY **OTHER TWO** QUESTIONS.

QUESTION ONE(30 MARKS)

- (a) Solve the equation $4x^2 + 4x - 1 = 0$ by completing the square and give the roots correct to two decimal places. (5 marks)
- (b) An arithmetic progression has fourth term 22 and the eighth term is 46.
(i) Find the first term and the common difference. (3 marks)
(ii) Find the sum of the first twelve terms. (2 marks)
(iii) Find the number n such that the sum of the first n terms is 310. (2 marks)
- (c) Solve by factors the cubic expression $18x^3 - 9x^2 - 5x + 2 = 0$. (5 marks)
- (d) Calculate the size of the largest angle in triangle ABC where $a = 35.0$ cm, $b = 16.8$ cm, $c = 23.8$ cm. (3 marks)
- (e) For the following frequency distribution:
- | Height (cm) | Number of plants |
|-------------|------------------|
| 40 – 44 | 6 |
| 45 – 49 | 10 |
| 50 – 54 | 25 |
| 55 – 59 | 11 |
| 60 – 64 | 8 |

- (i) State the class width, (1 mark)
- (ii) State the modal class, (1 mark)
- (iii) Calculate the mean. (3 marks)

(f) Two dice, coloured red and green respectively, are thrown in a game.

The player has to score a total of 9 or more in order to stay in a game.

Find the probability that:

- (i) The player scores a total of 9 or more, (1 mark)
- (ii) The player scores a total of 9 or more, given that the score on the green die is 3, (2 marks)
- (iii) The player scores a total of 9 or more, given that the score on the green die is 6. (2 Marks)

QUESTION TWO(20 MARKS): OPTIONAL

(a) Express:

- (i) $7\sqrt[4]{3}$ in the form $\sqrt[4]{p}$ where p is an integer. (1 mark)
- (ii) $\frac{3}{5}\sqrt{\left(\frac{6}{5}\right)}$ in the form $\sqrt{\left(\frac{p}{q}\right)}$ where p and q are integers. (1 mark)

(b) (i) Given $\sqrt{37} = 6.0827625$ and $\sqrt{35} = 5.9160798$, each correct to seven decimal places, find without tables or calculator the value of $\frac{1}{\sqrt{37}-\sqrt{35}}$ correct to six decimal places. (3 marks)

(ii) Simplify $\frac{2\sqrt{5}-3}{3\sqrt{5}-2}$ by expressing with a rational denominator. (3 marks)

(c) Solve without tables or calculator $\log_2(2x + 1) = \log_4(x + 2)$. (5 marks)

(d) (i) Solve without use of tables or calculator the equation $2^x = 32$; (1 mark)

(ii) Use tables or calculator to solve the equation $2^x = 10$, and give your answer correct to two decimal places. (2 marks)

(iii) Hence find the possible values of x if $2^{2x} - 42(2^x) + 320 = 0$. (4 marks)

QUESTION THREE(20 MARKS): OPTIONAL

(a) Determine the maximum value of the quadratic function $f(x) = 15 + 6x - 3x^2$ and the value of x for which this maximum is obtained. (5 marks)

(b)(i) In an arithmetic progression the first term is 6 and the common difference is 4. Find the tenth term and the sum of the first ten terms. (3 marks)

(ii) Find the common difference and the sum correct to two decimal places of the series

$$\log 5 + \log 5^2 + \log 5^3 + \log 5^4 + \log 5^5$$

(3 marks)

- (c) In a geometric progression the second term is 16 and the fifth term is 2. Determine the first term, the common ratio, and the sum of the first ten terms. (6 marks)
- (d) Mrs. Prudence deposits 2000 US dollars in a savings account on 1 January each year for 20 years. If the account gives 3% compound interest per annum, what will be the total value of her savings at the end of 20 years? Answer correct to the nearest US dollar. (3 marks)

QUESTION FOUR(20 MARKS): OPTIONAL

- (a) Calculate the mean and the standard deviation for the following marks:

<u>Mark</u>	<u>Number of Students</u>
90 – 99	3
80 – 89	32
70 – 79	43
60 – 69	21
50 – 59	1

(8 marks)

- (b) A bag contains 4 white beads and 1 black bead. The experiment of drawing a bead from the bag is repeated three times. Find the probability of drawing three white beads from the bag
- (i) if the bead is replaced after each draw, (1 mark)
- (ii) if the bead is not replaced after each draw. (4 marks)
- (iii) In the case of (ii), what is the probability that the third bead drawn will be black? (2 marks)
- (c) Expand $(5 + X)^4$ and simplify your answer. Use your expansion to evaluate 5.02^4 correct to two decimal places. (3 marks)
- (d) Find the coefficient of X^{10} in the expansion of $(2X - 3)^{14}$. (2 marks)