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University Examinations 2022/2023

FIRST YEAR FIRST SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATION FORTHE DEGREE OF BACHELOR OF SCIENCE EDUCATION

FIRST YEAR FIRST SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATION FORTHE DEGREE OF BACHELOR OF SCIENCE

FIRST YEAR FIRST SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATION FORTHE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION SCIENCE

FIRST YEAR FIRST SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATION FORTHE DEGREE OF BACHELOR OF SCIENCE IN ACTURIAL SCIENCE

FIRST YEAR FIRST SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATION FORTHE DEGREE OF BACHELOR OF SCIENCE IN STATISTICS

SMA 3110: MATHEMATICS FOR SCIENCE

DATE: AUGUST 2023 **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question one and any other two questions*

QUESTION ONE (30 MARKS)

a) Calculate the mean absolute deviation of: 5, 3 4, 7, 6, 4 (4 marks)

b) Solve $3x^2 - 7x + 4 = 0$, using completing square method (3 marks)

c) It has been observed that a football play success rate of taking penalty shots is ¼. If take 6 shots what is the probability that he succeeds in exactly 4 shots (3 marks)

d) Simplify the trigonometric expression $\frac{1}{1+cos\theta} + \frac{1}{1-cos\theta}$ (3 marks)

e) The 2nd, 6th and 14th term of an AP form the first 3 consecutive terms of a GP.

(a) Find the common ration of the Gp (3 marks)

(b) Given the common difference of an AP is 2 find

(i) The 1st and 5th term of the Gp (4 marks)

(ii) The sum of the first six terms of the Gp (3 marks)

f) If $\cos\theta = \frac{1}{4}$ and that θ is acute, find without using tables or calculator

(i) $\sin\theta$ (2 marks)

(ii) $cot\theta$ (2 marks)

QUESTION TWO (20 MARKS)

a) Solve for x in the equation $\left(\frac{27}{8}\right)^{x+7} - \left(\frac{4}{9}\right)^{-3x} = 0$ (3 marks)

b) Expand $(1 + 3x)^6$ up to the term with x^4. Hence estimate $(1.03)^6$ correct to 4 decimal places (4 marks)

c) Simplify $\frac{4-\sqrt{15}}{4+\sqrt{15}}$ (3 marks)

d) A factory produced 10,000 sweets in the first hour. The rate of product decreased by 20% every hour. Calculate

(i) The number of sweets produced in the 4th hour (3 marks)

(ii) The total number of sweets produced in the 5 hours (4 marks)

e) Solve the following equation $2x^2 + 4x - 9 = 0$, using completing the square method (3 marks)

QUESTION THREE (20 MARKS)

a) The amount of pocket money spent in a week by a party pf student is recorded in the table below

Amount of money (sh.)	Frequency
5 - 9	28
10 – 14	32
15 – 19	56
20 – 24	68
25 – 29	54
30 – 34	32
35 – 39	40

(i) State the size of class interval (1 mark)

(ii) Calculate median and the standard deviation (8 marks)

b) Find how may six digit numbers can be formed using the following digits: 3, 4, 5, 6 and 8 if:

(i) Every digit number appears once in any number (2 marks)

(ii) Repetition of digit is allowed (2 marks)

(iii) The numbers must be even and repetition of digit is allowed (2 marks)

c) Find the maximum value of the function $y = 5 - 8x + 2x^2$ in the form $y = a(x - p)^2 + q$ (4 marks)

QUESTION FOUR (20 MARKS)

a) Simplify the $\frac{4-\sqrt{15}}{4+\sqrt{15}}$ and hence evaluate the expression correct to 3 decimal places given $\sqrt{3} = 1.732$ and $\sqrt{5} = 2.236$ (3 marks)

b) Find $x\ log_3 x - \frac{1}{2} = \frac{3}{2} log_x 3$ (4 marks)

c) When the function $f(x) = x^5 + 4x^2 + ax + b$ is divided by $x^2 - 1$, the remainder is $2x + 3$. Find the value of a and b (7 marks)

d) Find the arithmetic mean and standard deviation of 16, 30, 15, 14, 18, 9, 20 (4 marks)

e) Calculate the discriminants of $3x^2 + 5x - 1 = 0$ and hence state the nature of the roots (2 marks)

QUESTION FIVE (20 MARKS)

a) Prove the following identify $sin^2 \cot\theta\ sec\theta = sin\theta$ (3 marks)

b) Without using calculator simplify completely by giving your answer in the form $a + b\sqrt{z}$

$\frac{Cos\ 750^0}{tan405 + tan510^0}$ (4 marks)

c) Given that $cos2\theta = 1 - sin^2\theta$ solve the following trigonometric equation: $3cos2\theta + sin\theta = 1$ for $0^o \leq \theta \leq 360^0$ (5 marks)

d) A triangle has the following measures $PQ = 3.6\ cm$, QR = 5.8cm and Rp = 8.2cm. determine the largest angle of triangle PQR (5 marks)

e) Show that $2sin75cos45^0 = \frac{1}{2}(\sqrt{3} + 1)$ (3 marks)