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University Examinations 2012/2013

FIRST YEAR, FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE, BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY, BACHELOR OF SCIENCE IN STATISTICS, BACHELOR OF SCIENCE IN PUBLIC HEALTH, BACHELOR OF SCIENCE IN CROP PROTECTION, BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE, BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE AND BACHELOR OF SCIENCE

SMA 2104: MATHEMATICS FOR SCIENCES

DATE: DECEMBER 2012 **TIME: 2 HOURS**

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

QUESTION ONE (30 MARKS)

a) Solve for x in the equation $Ax^2 + Bx + c = 0$ by completing the square method. (4 Marks)

b) Simplify $\frac{3+\sqrt{5}}{3\sqrt{5}-1}$ and leave you answer in the format $a + b\sqrt{c}$. (3 Marks)

c) In how many ways can the letters of the SUCCESS be arranged in a row.(4 Marks)

d) A geometric progression has the third term as 81 and the sixth term as 3. Determine;
   i. The first term
   ii. The common ratio (4 Marks)

e) Verify that $\frac{cos^2\theta(1-\sec^2\theta)\sin\theta}{\cos\theta\tan^{-1}(1-\sin^{-1}\theta)} = -\tan\theta$. (3 Marks)

f) The data lessons gives the weight (in kilograms) of employees in a certain firm
106,102,96,82,95,100,69
Find the;
   i. Arithmetic mean. (1 Mark)
   ii. Standard deviation. (2 Marks)
   iii. Median (1 Mark)

g) Find the remainder when $f(x) = 2x^3 + 5x^2 + 4x + 1$ is divided by $x + 3$). (3 Marks)

h) Two fair sided dice were tossed two times what is the probability that the sum of numbers on the two upper most faces is;

i. Seven (3 Marks)
ii. Greater than 5. (2 Marks)

QUESTION TWO (20 MARKS)

a) The table below shows the masses of 50 students in a certain school

Mass in kg	Number
50-59	4
60-69	5
70-79	9
80-89	14
90-99	8
100-109	4
110-119	6

Find;

i. Mean (3 Marks)
ii. Median (3 Marks)
iii. Variance (3 Marks)
iv. Standard deviation (1 Mark)

b) In a large city 15% of the population has green eyes.
   i. What is the probability, that two out of five people chosen at random will have green eyes? (2 Marks)
   ii. What is the probability that exactly two of the group of twenty randomly chosen people will have green eyes? (4 Marks)
   iii. What is the probability that more than two of a group of twenty randomly chosen people have green eyes? (4 Marks)

QUESTION THREE (20 MARKS)

a) Sketch the graph of the function $y = 4\sin 3x$ with x in the domain $0^{\circ} \leq x \leq 240°$. (4 Marks)

From the sketch or otherwise determine;
   i. The Amplitude (1 Mark)
   ii. The period of the function. (1 Mark)

b) Solve the equation $12\cos^2\theta + \sin\theta = -11$ on the domain $0^{\circ} \leq \theta \leq 360°$. (4 Marks)

c) Simplify without using calculators or mathematical table the expression.
   i. $\frac{(3^2)^{3/2} \times (8^{1/3})^2}{3^2 \times (4^3)^{1/2} \times 9^{-1/2}}$ (3 Marks)
   ii. $\log 64 - \log 128 + \log 32.$ (2 Marks)

d) A polynomial $f(x)$ has a remainder 9 when divided by $x - 3$ and a remainder 5 when divided by $2x + 1$). Find the remainder when $f(x)$ is divided by $(x - 3)(2x + 1)$. (5 Marks)

QUESTION FOUR (20 MARKS)

a) The University examination committee of nine members is to be formed from nine lectures, eight administrators and the Dean. In how many ways can the committee be formed if
   i. The Dean must be a member. (4 Marks)
   ii. In order to include the Dean and five administrations. (4 Marks)

b) Write the first three terms in the expansion in ascending powers of x in $(3-2x)^8$ hence evaluate $(2.98)^8$ correct to 3 decimal places. (6 Marks)

c) A customer made a deposit of 25,000 in an account which pays compound interest at the rate of 5 present per annum. How much is his investment worth ten years latter? (6 Marks)

QUESTION FIVE (20 MARKS)

a) Find the sum of the series

$$\sum_{r=2}^{18}\left(5-\frac{r}{2}\right)$$

(5 Marks)

b) Find the roots of the following polynomial $x^4-9x^2+8=0$. (4 Marks)

c) The period it takes two machines to distil one cubic litre of water differs by one minute. Together the two machines takes one hour to distil 27 cubic litres of water. How long does it take each of them to distil one cubic litre of water? (6 Marks)

d) Prove that $\sin^2\theta+\cos^2\theta=1$ where θ is an acute angle in a right angles triangle. (5 Marks)