EMBU UNIVERSITY COLLEGE

(A CONSTITUENT COLLEGE OF THE UNIVERSITY OF NAIROBI)

FIRST SEMESTER EXAMINATIONS 2014/2015

FIRST YEAR EXAMINATION FOR THE DIPLOMA IN CROP PROTECTION

ACP 011: MATHEMATICS, BIOMETRY AND COMPUTER USE

DATE: DECEMBER 16, 2014 **TIME: 13:30 – 15:30**

INSTRUCTIONS:

Answer Question ONE and ANY Other TWO Questions.

QUESTION ONE

a) i) Simplify

$$\frac{t^{\frac{1}{2}}+t^{-\frac{1}{2}}}{t^{\frac{3}{2}}}$$

(2 marks)

b) Rationalize the denominator and simplify

$$\frac{3-\sqrt{5}}{1-3\sqrt{5}}$$

(3 marks)

c) Solve for x in the equation

$$\log_3 x - 4\log_x 3 + 3 = 0$$ (4 marks)

d) Find a relationship between p and q if the roots of

$px^2 + qx + 1 = 0$ are equal. (3 marks)

e) If α and β are the roots of $x^2 + 3x - 2 = 0$ find the values of $\alpha^3 + \beta^3$ and $\alpha^3\beta^3$.

Write down the equation whose roots are α^3 and β^3 (4 marks)

f) Calculate the sample standard deviation of the following frequency distribution given an assumed mean of 65.5.

Marks	frequency
40 – 49	5
50 – 59	18
60 – 69	27
70 – 79	15
80 – 89	6

(4 marks)

g) Explain the meaning of the following concepts as used in probability theory

i) Mutually exclusive events (1mark)

ii) Independent events (1mark)

iii) Random variable (1mark)

iv) Binomial Distribution (1mark)

h) Explain the difference between Completely Randomized Design and Randomized Complete Block Design as used in experimental design (4 marks)

i) Explain the usefulness of internet as a source of information (2 marks)

QUESTION TWO

a) The following are the IQ's of 16 college students: 120, 105, 112, 108, 102, 117, 100, 108, 103, 107, 115, 143, 98, 126, 103 and 114.

Construct a stem and leaf display with the stem labels

9, 10, ….., and 14 and use it to find the median.

b) The following are the marks which 50 students obtained in a mathematics test

73	65	82	70	45	50	70	54	32	75
75	67	65	60	75	87	83	40	72	64
58	75	89	70	73	55	61	78	89	93
43	51	59	38	65	71	75	85	65	85
49	97	55	60	76	75	69	35	45	63

i.) Construct a frequency distribution table starting with the class 30 - 39, 40 – 49, ….. and 90 – 99. (3 marks)

ii.) Convert the frequency distribution obtained in (b) (i), above into a cumulative "less than" distribution beginning with "less than 30" (3 marks)

iii.) From the distribution table in (b) (ii), calculate the mean mark (4 marks)

QUESTION THREE

a) A box contains 5 different coloured marbles having the following colours: Yellow, red, green, orange and purple. Three of these are selected from the box at random, one at a time so that only those remaining in the box have a chance of being selected each time. Once selected, the marble is not replaced. Compute the probability that:

A = 1^{st} marble is yellow in colour,

B = 2^{nd} marble is green,

C = 3^{rd} marble is orange.

Hence determine the probability of selecting a yellow, green and orange marbles in that order. (5 marks)

b) A brick manufacturer is interested in the number of defective bricks churned out of his kiln due to the overheating. Similar kilns worldwide are known to have about 0.4 of all bricks overheated during the brick manufacturing process. He selects ten randomly sampled bricks for investigation. Using Binomial distribution, compute the probability that 4 bricks out of these ten are overheated. Hence compute the array of probabilities that 0, 1,2,3,4,5,6,7,8,9,10 bricks will be overheated from a random sample of 10 bricks.

(5 marks)

c) Records show that the probability is 0.00005 that a car will have a flat tyre while driving through a certain tunnel. Use the Poisson approximation to the binomial distribution to find the probabilities that among 10,000 cars passing through this tunnel:

i) At least two will have a flat tyre and

ii) At most two will have a flat tyre. (5 marks)

QUESTION FOUR

a) Given the general quadratic equation; $ax^2 + bx + c = 0$, derive the quadratic formula

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ Hence use the formula to solve the equation

$0.3(x - 5) = x^2 - 1.7$ (5 marks)

b) Suppose the mean cholesterol levels are to be compared for adults in four socioeconomic classes – poverty, low income, middle income and high income. If random samples of each socioeconomic class are selected to make the comparison, identify each of the following elements of the experiment:

i) Response
ii) Factor(s) and factor type(s)
iii) Treatments
iv) Experimental units (5marks)

c) To study their attitude towards social issues, 1200 persons were asked (among other things) whether we are spending "too little", "about right amount", or "too much" on social welfare programs. Draw a pie chart to display the results shown in the following table:

	Number of persons
Too little	296
About right amount	360
Too much	544

(5 marks)

QUESTION FIVE

a) Describe the use of computers in the following areas.

i) Bank
ii) Homes
iii) Industries
iv) Transport
v) Supermarket (5 marks)

b) The 21st century has had many forms of ICT technologies improving the various means of communication. However, these changes have brought many challenges.

Explain briefly five negative social impacts of these technologies. (5 marks)

c) Explain the following features as used in word processing. (5 marks)

i.) Word wrap
ii.) Thesaurus
iii.) Auto complete
iv.) Help
v.) Find and replace

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