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**KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR**  
**FIRST YEAR, SECOND SEMESTER EXAMINATION**  
**FOR THE DEGREE OF BACHELOR OF SCIENCE**  
**(BUSINESS ADMINISTRATION)**

Date: 20<sup>th</sup> April, 2023  
Time: 11.30am – 1.30pm

**KBA 106 - BUSINESS MATHEMATICS**

**INSTRUCTIONS TO CANDIDATES**

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

**QUESTION ONE (30 MARKS)**

- a) Given the sets  $A = \{a, b, c, d, x, y, z\}$ ,  $B = \{e, f, y, z\}$  and  $C = \{b, d, g, h, k\}$  find:
- (i)  $A \cap B$  (1 mark)
  - (ii)  $(A \cap B) \cap C$  (2 marks)
  - (iii)  $(B \cap C) - A$  (2 marks)
- b) What sum of money will amount to Ksh. 21,600 in 4 years kept in an account that gives 2% p.a. simple interest? (4 marks)
- c) Solve the following quadratic equation by completing the square method  $x^2 + 4x - 12 = 0$  (3 marks)
- d) Solve the following simultaneous equation using matrix method
- $$\begin{aligned} 2x + y &= 6 \\ y - 5x &= 2 \end{aligned}$$
- (3 marks)
- e) A single deposit of Sh.150000 is invested for four years at a compound interest. Determine the rate at which the investment will be Sh. 182,326 if compounded annually. (3 marks)
- f) Find the derivatives the following functions  $2x^3 + 7x + 8$  (2 marks)
- g) Evaluate  $\frac{20!}{3!8!}$  and hence write  $50 \times 49 \times 48 \times 47 \times 46$  in factorial form. (3 marks)
- h) Solve  $\frac{3x-1}{x+3} = \frac{3x+2}{x+1} = 3$  (3 marks)
- i) The tangent to the curve  $y = x^2 - 5x + 5$  parallel to the line  $2y = 4x + 1$ , also passes through a point. Find the coordinates of the point. (4 marks)

### **QUESTION TWO (20 MARKS)**

- a) Out of a group of 85 people, 30 invested in the stock market, 45 had certificates of deposits (CD's) and 44 had saving bonds. Furthermore, 23 had both CD's and bonds, 13 had both CD's and stocks and 13 had stocks and bonds. Finally 10 of the people had no investments. Use a Venn diagram to determine how many of the people had:
- i) All the three types of investments (4 marks)
  - ii) At least two investments (2 marks)
  - iii) At most two investments (1 mark)
  - iv) Saving bonds only (1 mark)
  - v) CD's only (1 mark)
- b) The eighth and fifth terms of a G.P are 4374 and 162 respectively. Determine the seventh term. (4 marks)
- c) Solve the following quadratic equations using the stated method;
- i.  $4x^2 - 3x - 1 = 0$  (completing squares) (4 marks)
  - ii.  $3x^2 = x + 10$  (factorization) (3 marks)

### **QUESTION THREE (20 MARKS)**

- a) Derive the quadratic formula by solving the equation  $ax^2 + bx + c = 0$  where  $a, b$  and  $c$  are real numbers and  $a \neq 0$  hence use the derived formula above to solve the equation  $2x^2 + 7x - 15 = 0$ . (5 marks)
- b) Several families went to a movie together. They spent Ksh19.25 for 8 tickets. If adult ticket cost Ksh3.50 and the children's ticket cost Ksh1.75 how many of each kind of tickets were bought? (6 marks)
- c) Let  $x, y$  and  $z$  denote the cost of 3 different commodities produced by a company in Kawangware. The combination of the levels of production can be summarized as follows;
- $$\begin{aligned} 6x + 5y + 3z &= 16 \\ 4y + 8x + 5z &= -8 \\ 3z + 7x + 6y &= 0 \end{aligned}$$
- Determine the cost of each commodity using matrix method; (9 marks)

### **QUESTION FOUR (20 MARKS)**

- a) Express  $\frac{8 - 3\sqrt{2}}{4 + 3\sqrt{2}}$  in the form  $a + b\sqrt{2}$  where  $a$  and  $b$  are integers. (4 marks)
- b) A survey of 500 television viewers produced the following information. 280 watch football, 190 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball. 50 do not watch any of the three games.
- i) How many watch all the three games? (4 marks)
  - ii) How many watch exactly one of the three games? (4 Marks)
- c) The cost of one text book is  $t$  shillings and the cost of one pen is sh.  $p$ . John spent Sh. 240 to buy 2 text books and 5 pens while Peter spent Sh. 280 to buy 2 textbooks and 8 pens. Using matrix method, find the cost of each item. (8 marks)

**QUESTION FIVE( 20 MARKS)**

- a) A committee of 5 people is to be selected from 6 men and 4 women. Find
- i) the number of different ways in which the committee can be selected (2 marks)
  - ii) the number of these selections with more women than men. (3 marks)
- b) If Sh.100,000 is invested for four years at compound interest, it will amount to Sh.542370. Find;
- i) the interest rate applied in this investment (3 marks)
  - ii) interest earned over the four years (2 marks)
- c) The marginal cost function of manufacturing  $x$  units of a commodity is  $6 + 10x - 6x^2$ . Find the total cost and the average cost, given that the total cost of producing 1 unit is 15. (6 Marks)
- d) Solve the following simultaneous equations using the indicated method
- i)  $2x + y = 12$   
 $y - 3x = 2$  (Matrix) (3 marks)
  - ii)  $5x + y + 6 = 8$   
 $y - 2 + 6x = 12$  (Substitution) (2 marks)