

KASNEB

DICT LEVEL I

COMPUTER MATHEMATICS

TUESDAY: 17 November 2015.

Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

- (a) Determine the nine and ten complement of the following numbers:
- (i) 85435. (2 marks)
 - (ii) 440062. (2 marks)
 - (iii) 88664226. (2 marks)
 - (iv) 679522. (2 marks)
- (b) Write the decimal integer 211 into XS – 3BCD code. (3 marks)
- (c) Convert the decimal number 312 into a 4 – BCD code. (3 marks)
- (d) Convert the following numbers:
- (i) 1011.11_2 to base 10. (3 marks)
 - (ii) 43_8 to base 2. (3 marks)

(Total: 20 marks)

QUESTION TWO

- (a) Define the following terms as used in set theory:
- (i) Finite set. (1 mark)
 - (ii) Null set. (1 mark)
 - (iii) Sub-set. (1 mark)
 - (iv) Universal set. (1 mark)
- (b) A class has 60 students who take Computer Mathematics and Financial Accounting subjects. Every student takes at least one of these subjects and some students take both subjects. There are 55 students who take Computer Mathematics and 45 students who take Financial Accounting.
- Required:**
The number of students who take both subjects. (4 marks)
- (c) Convert the following binary numbers to their decimal equivalent:
- (i) 10101_2 . (2 marks)
 - (ii) 10111_2 . (2 marks)
 - (iii) 100011_2 . (2 marks)

- (d) Convert the following hexadecimal numbers to their decimal equivalent:
- (i) 28_{16} . (2 marks)
- (ii) $2F_{16}$. (2 marks)
- (iii) $BC12_{16}$. (2 marks)
- (Total: 20 marks)**

QUESTION THREE

- (a) Express the following octal numbers into decimal numeral system:
- (i) 27_8 . (2 marks)
- (ii) 30_8 . (2 marks)
- (iii) 4307_8 . (2 marks)
- (b) Perform the following binary arithmetic operations:
- (i) $00010011 + 00111110$. (2 marks)
- (ii) $00110011 - 00010110$. (2 marks)
- (iii) $00010111 \times 000000101$. (2 marks)
- (iv) $00101010 \div 00000111$. (2 marks)
- (c) Davies and Dennis purchased clothes from a supermarket. Davies bought 8 pairs of trousers, 10 shirts and 4 jackets. Dennis bought 6 pairs of trousers, 7 shirts and 5 jackets. The supermarket sells a pair of trousers at Sh.800, a shirt at Sh.500 and a jacket at Sh.1,500.
- Required:**
Using matrix algebra, determine the amount of money spent by each person. (3 marks)

- (d) Solve the following simultaneous equations using the substitution method:
- $$6x + 2y = 14$$
- $$10x + 4y = 24$$
- (3 marks)
- (Total: 20 marks)**

QUESTION FOUR

- (a) Examine four characteristics of a good average as a measure of central tendency. (8 marks)
- (b) The probability that a patient is allergic to penicillin drug is 0.20. Suppose this drug is administered to three patients.
- Required:**
- (i) A tree diagram to represent the above information. (4 marks)
- (ii) The probability that all the three patients are allergic to the penicillin drug. (2 marks)
- (iii) The probability that at least one of the patients is not allergic to the penicillin drug. (2 marks)
- (c) Show that $(A \cap B) \cup C = A \cap (B \cup C)$ if $C \subseteq A$. (4 marks)
- (Total: 20 marks)**

QUESTION FIVE

- (a) Write down the negation of the following statements:
- (i) $(P \vee \sim Q)$. (1 mark)
- (ii) $(P \wedge Q) \rightarrow R$. (2 marks)

- (b) (i) Show that the inverse and the converse of a conditional $P \rightarrow Q$ are logically equivalent. (3 marks)
- (ii) Show that $P \rightarrow Q$ and $\sim P \vee Q$ are logically equivalent. (3 marks)
- (iii) Show that $(P \rightarrow Q) \vee (Q \rightarrow P)$ is a tautology. (3 marks)
- (c) Construct a truth table for $(P \rightarrow Q) \wedge (Q \rightarrow R)$. (3 marks)
- (d) The data below relate to the weight of 90 students in a class:

| Weight (kilograms) | Number of students |
|--------------------|--------------------|
| 45 – 50 | 15 |
| 50 – 55 | 20 |
| 55 – 60 | 22 |
| 60 – 65 | 15 |
| 65 – 70 | 8 |
| 70 – 75 | 3 |
| 75 – 80 | 4 |
| 80 – 85 | 2 |
| 85 – 90 | 1 |

Required:
The coefficient of variation of the weight of the students.

(5 marks)
(Total: 20 marks)

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