061306T4CSC

COMPUTER SCIENCE LEVEL 6

ICT/OS/CS/CR/03/6/A

Understand Mathematics for Computer Science

Nov/Dec 2024

TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)

WRITTEN ASSESSMENT

Time: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. Marks for each question are indicated in the brackets.
2. The paper consists of **TWO** sections: **A** and **B**.
3. Candidates are provided with a separate answer booklet
4. **DO NOT** write on this question paper.

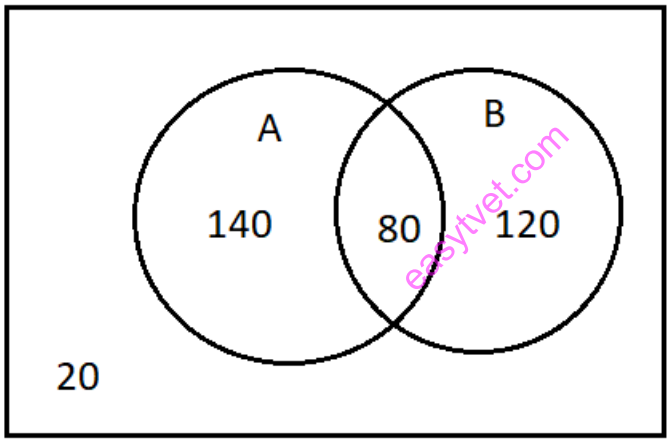
This paper consists of Four (4) printed pages

Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A (40 MARKS)

Answer ALL the questions in this section.

1. The probability that Team *x* and Team *y* win a match is 0.2 and 0.4 respectively. Determine the probability that both teams win a match. (2 marks)
2. Given that a set A ={a, e, i, o, u, y}. Determine |A|. (2 marks)
3. A set B ={1,2,3,5,7,11,13,17, 19,23,41} and set D ={1,3,5,7,11,15,19}. Evaluate the cardinality of: (6 marks)
   i. B ∩ D
   ii. B ∪ D
4. According to the survey made among 200 trainees, 140 students like cold drinks, 120 students like milkshakes and 80 like both. Use Venn diagram to find the number of students who like at least one of the drinks. (5 marks)



5. Find the value matrix A, so that the equality is satisfied. (5 marks)

   $A + \begin{bmatrix} 2 & 3 \\ -4 & 1 \end{bmatrix} = \begin{bmatrix} 5 & -1 \\ 1 & 5 \end{bmatrix}$

6. Find the value of x in the linear equation below. (4 marks)

   $$\frac{3x+1}{2} = \frac{2x-2}{4}$$

7. Calculate the value of y in the following equation. (3 marks)

   $6.\sqrt{4y} = 48$

8. Outline the operator precedence for evaluating Boolean expressions. (2 marks)

9. Boolean algebra can be applied to any system in which each variable has two states. State any two application areas of Boolean algebra. (2 marks)
10. An office secretary procured 3 printers and 1 computer at the cost of USD 700 in the first month. She later bought 5 printers and 2 computers at the cost of USD 1200 in the second month. Use the matrix method to determine the price of a printer and a computer. (5 marks)
11. Find the co-ordinates of the point on the graph $y = 4x^2 - 2x + 1$ where the gradient is 2. (4 marks)

SECTION B (60 MARKS)

Answer THREE questions in this section.

QUESTIONS 12 IS COMPULSORY.

12. Tebogo, Dirck and Berry are competing in archery in next year's Olympic games. The probability of Tebogo hitting the target is $\frac{2}{5}$, that of Dirk hitting the target is $\frac{1}{4}$ and that of Berry hitting the target is $\frac{3}{7}$. Calculate the probability that in one attempt:

a. Only one participant hits the target. (6 marks)
b. All three hit the target. (3 marks)
c. None of them hits the target. (3 marks)
d. Two hit the target. (6 marks)
e. At least one hits the target. (2 marks)

13.

a. Find the complement of the following functions by applying De Morgans Theorem. (8 marks)
   i. F(x, y, z) = x'yz' + x'y'z
   ii. F(x, y, z) = x(y'z + yz)
b. Given the Boolean algebra $x + yz = (x + y)(x + z)$, use a truth table to prove the distributive law. (9 marks)
c. Draw a logic circuit diagram whose output is: A'B + BC. (3 marks)

14.

a. Three severs in a research institute have different probabilities of breaching down during an exploration program as shown in the table below.

Server	**Probability of breaking**

A	$\frac{4}{15}$
B	$\frac{3}{10}$
C	$\frac{2}{11}$

Table 1

Calculate:

i. The probability that all servers break down during the exploration activity. (2 marks)

ii. The probability that none of the servers will break down. (4 marks)

b. Data representation tools include histograms, pie charts and bar graphs. Explain any FOUR advantages of using a pie chart to represent data. (8 marks)

c. If n(A - B) = 8, n(A ∪ B) = 60 and n(A ∩ B) = 20, then find n(B). (6 marks)

15.

a. Find the integral $\int (2x + 6)^5 \, dx$ by substituting u = 2 x +6 and $\frac{1}{2}du = dx$. (4 marks)

b. Ninety students obtained the marks shown in the distribution table below.

Marks	10 - 20	20 - 30	30 -40	40 - 50	50 – 60	60 - 70	80 - 90
Number of Students	7	10	10	20	20	15	8

Calculate:

i. The mean mark. (4 marks)

ii. The median mark. (6 marks)

c. Explain the difference between Variance and Standard deviations as measures of spread. (2 marks)

d. Find the value of x in the linear equation $\frac{2x-3}{x+1} + 2 = 3$ (4 marks)

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