GRETSA UNIVERSITY - THIKA

UNIVERSITY EXAMINATIONS

JANUARY – APRIL 2026 SEMESTER

BACHELOR OF EDUCATION, COMPUTER SCIENCE

COURSE CODE: BSCS 100

COURSE TITLE: DISCRETE STRUCTURES 1

DATE: 10 APRIL 2026 **TIME: 2 HOURS**

INSTRUCTIONS TO CANDIDATES

1. SECTION A IS **COMPULSORY.**
2. SECTION B: ANSWER ANY OTHER **TWO** QUESTIONS.
3. **DO NOT** WRITE ANYTHING ON THIS QUESTION PAPER AS IT WILL BE AN EXAM IRREGULARITY.
4. ALL ROUGH WORK SHOULD BE AT THE BACK OF YOUR ANSWER BOOKLET AND CROSSED OUT.

CAUTION: *All exam rooms are under CCTV surveillance during the examination period.*

SECTION A: COMPULSORY

Question One

a) The roots of the equation $2x^2 - 7x + 4 = 0$ are $\alpha \wedge \beta$.Find the equation whose roots are $\frac{\frac{1+\alpha}{\beta} \wedge 1+\beta}{\alpha}$ **[5 Marks]**

b) In a class of 100 students, 35 like geography, 45 like history and 10 like both. How many like either of them, and how many like neither? **[3 Marks]**

c) Define a complex number, hence using own clear examples, describe polar and Euler forms of complex numbers. **[3 Marks]**

d) Find the set of all values of x such that $12x^2 < x + 6$. **[4 Marks]**

e) When the polynomial f(x) =

$x^3+2x^2-5ax-7$ *is divided by* $x+1$, *the remainder is* R_1. *Again, when polynomial* $g(x)=x^3+ax^2-12x+6$ *is div*

[4 Marks]

f) Given that the equation $2x^2 - 7x + 4 = 0$ has roots $\alpha \wedge \beta$, find the value of $\frac{4}{\alpha}+\frac{4}{\beta}$

[4 Marks]

g) If $U=\{natural\ numbers\ less\ than\ 20\}, P=\{prime\ numbers\ less\ than\ 20\}$ and Q ¿$\{odd\ numbers\ less\ than\ 20\}$. Represent above information in a Venn diagram

[3 Marks]

h) Give the truth table of the proposition given by $(p \bigvee q) \Leftrightarrow (p \Lambda q)$. **[4 Marks]**

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION TWO (20 MARKS)

a) Determine if x + 2 is a factor of x^4-7x^2-6x. If so find the other factors. **[6 Marks]**

b) If $z=-2\sqrt{3}-2i$, find |Z| and the argument of Z. **[5 Marks]**

c) Let f(x) = $3x^3$- $5x^2$ +3x -10 , find the remainder if f(x) is divided by x-1 using Long division

[4 Marks]

d) A committee of 6 people is to be formed from 9 women and 3 men. In how many ways can the committee be formed so that it includes at least 1 man. **[5 Marks]**

QUESTION THREE (20 MARKS)

a) A mixed rugby team containing 5 men and 6 women is to be chosen from 8 men and 9 women. In how many ways can this be done? **[5 Marks]**

b) Let **U = {1,2,3,4,5,6,9}**, **A = {1,2,3,4}**, **B = {2,4,6}** and **C = {1,3,6,9}**. Find the set $\mathbf{A^c \cap B}$ and $\mathbf{A^c \cap (B \cup C^c)}$ **[5 Marks]**

c) The roots of the equation $2x^2 - 7x + 4 = 0$ are $\alpha \wedge \beta$.Find the equation whose roots are $\frac{\frac{\alpha}{\beta} \wedge \beta}{\alpha}$.

[5 Marks]

d) State the converse, inverse and the contrapositive of the statement, "if a triangle is equiangular, then it is equilateral". **[3 Marks]**

e) Answer the following with either True of False(give a reason where necessary)

i. An empty set is not a subset of every set. **[1 Mark]**

ii. If f(x-r) is a factor of a polynomial f(x), then f(r) =0. **[1 Mark]**

QUESTION FOUR (20 MARKS)

a) Show that $\sqrt{3}$ is irrational. **[4 Marks]**

b) Find the binomial expansion of $(2+2x)^5$, hence use the expansion to estimate the value of $(2.02)^5$

[4 Marks]

c) How many even numbers, greater than 500,000 can be formed using the digits 3,4,5,6,7.

[4 Marks]

d) Given $z_1 = 2+i$ and $z_2 = 2+\sqrt{3}i$.solve for $\frac{z_1}{z_2}$ **[4Marks]**

e) Find the contrapositive of the converse of $p \rightarrow q$. **[4 Marks]**

QUESTION FIVE (20 MARKS)

a) Given two sets A and B, such that $A=\{2,4,6,8,10,12\}$ and $B=\{3,6,9,12\}$. Show that $n(A \cup B)=n(A)+n(B)-n(A \cap B)$ **[5 Marks]**

b) Use De Moivres theorem to simplify $(1+i\sqrt{3})^{40}$ **[5 Marks]**

c) Out of a group of 85 people, 30 like beef, 45 like goat meat and 44 like pork. In addition, 23 like both goat meat and pork, 13 like goat meat and beef and another 13 like beef and pork. 10 of the people like none of the meat.

i) Use a Venn diagram to present above information. **[5 Marks]**

ii) How many like at most two meat types **[3 Marks]**

iii) How many people like goat meat only? **[2 Marks]**