CENTRAL UNIVERSITY

SCHOOL OF ENGINEERING AND TECHNOLOGY

RESIT EXAMINATION – 2021/22

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

ITEC212

DISCRETE MATHS II

INFORMATION TECHNOLOGY

LEVEL 200

2 HOURS

STUDENT INDEX No .....

INSTRUCTIONS

- SECTION A: ANSWER ALL QUESTIONS (40 MARKS)
- SECTION B: ANSWER TWO (2) QUESTIONS ONLY (60 MARKS)

ANSWER SECTION A AND SECTION B IN THE ANSWER BOOKLET PROVIDED

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Course Lecturer: Regina Naa Dedei Crabbe

SECTION A [40 MARKS]

ANSWER ALL QUESTIONS

1. Draw an **EX-NOR** logic gate and its corresponding truth table. **[6 marks]**
2. Draw the truth table for a **NOR** logic gate. **[4 marks]**
3. Draw the truth table for an **NAND** logic gate. **[4 marks]**
4. Using Pascal's Triangle, expand $(x + 2)^4$ **[4 marks]**
5. Represent this complex number $-2 + 3i$ on a plane. **[4 marks]**

Solve the following

6. $(9 + i) + (2 - 3i)$ **[3 marks]**
7. $(-2 - 4i) + (-4 + 7i)$ **[3 marks]**
8. $(-4i) - (2 - 3i)$ **[3 marks]**
9. $(3 - 2i)(2 + 5i)$ **[4 marks]**
10. If $z = -1 + 7i$, find the absolute value of z. **[5 marks]**

SECTION B

ANSWER TWO QUESTIONS FROM THIS SECTION [60 MARKS]

QUESTION ONE [30 MARKS]

1A. Find the coefficient of x^3 in the expansion of $(x + 3)^5$ **[6 marks]**

1B. In a sports team of 20 people, we need 11 of them for the football team, 6 of them for the basketball team and 3 of them for the table tennis team. How many different ways can we divide them? **[6 marks]**

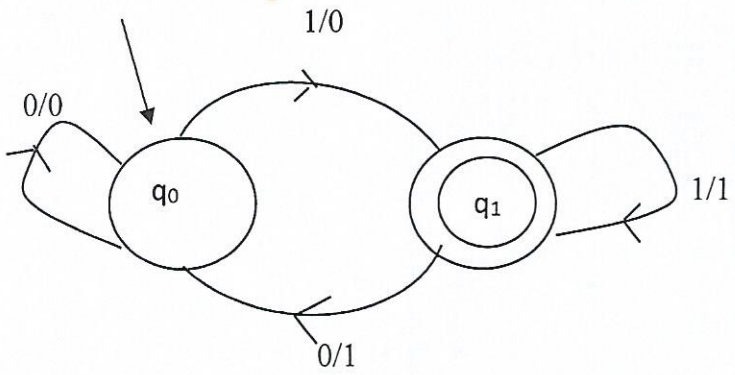
1C. Convert $2 - 2\sqrt{3}i$ to polar coordinates. **[12 marks]**

1D. Draw logical diagram to represent the Boolean expression

$$X = (Y + K) + (K(S + V)) \quad \textbf{[6 marks]}$$

QUESTION TWO [30 MARKS]

2A. Based on the state diagram below, write the state sequence and the output for the input 0 1 1 0 1 0 0 1. **[10 marks]**



2B. In the expansion of $(3x + 2y + 3z - 2w)^7$ what is the coefficient of x^3yw^3 **[5 marks]**

2C. Let $z_1 = 2 - 2i$ *and* $z_2 = -1 + 4i$. Evaluate $\bar{z}_1 z_2 - \overline{2z_2}$ leaving your answer in the form $a + bi$. **[10 Marks]**

2D. Draw the corresponding logical diagram for the expression $Z = R + GJK + FW$

[5 marks]

QUESTION THREE [30 MARKS]

3A. Write the truth table for the expression $H = \overline{\bar{D}\,(Y\ P)}$ **[10 marks]**

3B. Evaluate $\frac{3-i}{2+3i}$ **[6 marks]**

3C. If $z = -1 + 7i$, find the absolute value of z. **[4 marks]**

3D. Prove that $2 + 4 + 6 + \cdots + 2n = n(n + 1)$ by mathematical induction.**[10 marks]**