Goa Vidyaprasarak Mandal's
Gopal Govind Poy Raiturkar College of Commerce and Economics
Farmagudi, Ponda – Goa.
B.C.A. CBCS (Semester-II) End Examination, April / May 2023
CORE COURSE
CAC-107 APPLIED MATHEMATICS

Duration – 2 hours Marks-60

Instructions: 1) Question 1-6 are compulsory.
2) Figures to the right indicate full marks.

Q1] A. Fill in the blanks: (5×1=5)

1) An ordered selection or arrangement of r objects from a set of n objects is called _____.
2) Base of the hexadecimal number system is _____.
3) Symbolic form of "Geeta is practical but not lazy" is _____.
4) Let 'n' be a nonnegative integer, then $\sum_{k=0}^{n}\binom{n}{k}$ =_____.
5) The value of (1+0)·$(\overline{1+1})$ in Boolean algebra is _____.

Q1] B. Answer the following questions: (5×1=5)

1) If A={1, 3, 5, 7, 9, 11, 13} and B ={3, 4, 5, 6, 7} then find $A \cap B$.
2) Define Partial order relation.
3) If the function $f: \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = 3x - 4$. Determine $f(3)$.
4) State Pigeonhole Principle.
5) Draw two input NAND gate symbol.

Q2] Answer the following questions:

A. A bit is either 0 or 1. A byte is a sequence of 8 bits. Find
i) the number of bytes that can be formed from 8 bits
ii) the number of bytes that begin with 11 and ends with 11. **(02)**

B. Prove that $4 + 8 + 12 + \cdots + 4n = 2n(n+1)$ using mathematical induction. **(03)**

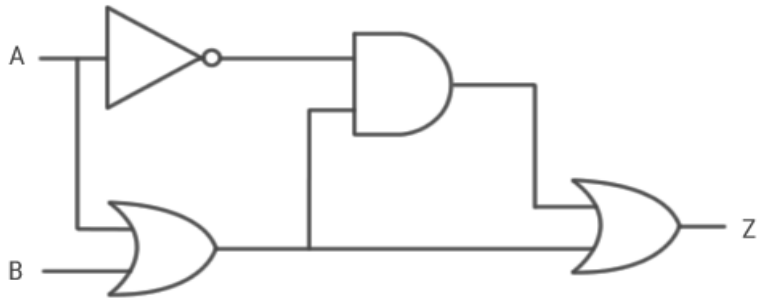
C. Find the expansion of $(x + 2y)^5$. **(05)**

Q3] Answer the following questions:

A. If $f: \mathbb{R} \to \mathbb{R}$ and $g: \mathbb{R} \to \mathbb{R}$ are defined by the formulas $f(x) = x + 2$ for all $x \in \mathbb{R}$ and $g(x) = x^2$ for all $x \in \mathbb{R}$. Then find $(g \circ f)(x)$ and $(f \circ g)(x)$. **(02)**

B. Show that $4 - \sqrt{2}$ is irrational. **(03)**

C. Find the output Z for given input $A = 1,\ B = 0$ from the following circuit by giving proper illustration of the gates. **(05)**



Q4] Answer the following questions:

A. In how many ways can the letters of the word TUESDAY be arranged? How many of them begin with T and end with Y? **(02)**

B. Show that the mapping $f: \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 3x + 8$, where $x \in \mathbb{R}$ is invertible. Define its inverse. **(03)**

C. Show that $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$, n≥1 by mathematical induction. **(05)**

Q5] Answer the following questions:

A. Find symmetric difference of two sets *A* and *B* if $A = \{1, 2, 3, 4, 5\}$ and $B = \{3, 5, 7, 9\}$. **(02)**

B. Let $A = \{1,2,3,4\}$ and a relation on *A* be
$R = \{(1,1), (1,2), (2,1), (2,2), (2,3), (3,3), (4,4)\}$. Is the given relation reflexive, symmetric, transitive? Justify your answer. **(03)**

C. Convert $(6703)_8$ to its binary form. **(05)**

Q6] Answer the following questions:

A. Let $U = \{1,2,3,4,5,6,7\},\ A = \{1,2,3\},\ B = \{2,3,4\}$.
Verify De Morgan's law. **(02)**

B. Prove that $(a + b) \cdot \left(\bar{b} + c\right) + b \cdot (\bar{a} + \bar{c}) = a \cdot \bar{b} + a \cdot c + b$ **(03)**

C. Construct the truth table for $(p \vee q) \rightarrow (\sim p \wedge \sim q)$ **(05)**

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