

F. Y. B.Sc. (Computer Science) SEM – I (2018 COURSE) (CBCS): WINTER – 2018
SUBJECT : ALGEBRA – I

Day : Monday
 Date : 15/10/2018

W-2018-0888

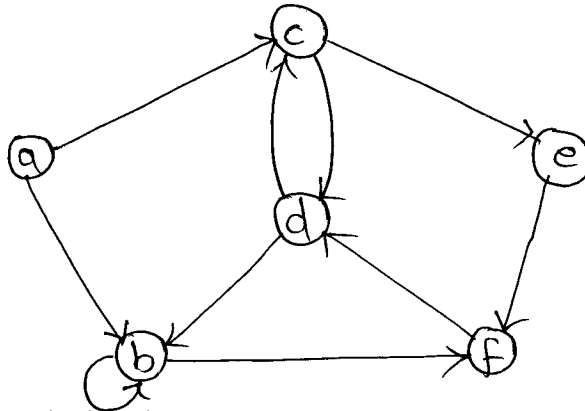
Time : 11.00 AM TO 02.00 PM
 Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.

Q.1 Attempt **ANY TWO** of the following: **[12]**

- a) Prove that R is equivalence relation, if R be a relation on \mathbb{Z} defined by xRy if and only if $x + 4y$ is divisible by 7.
- b) Find transitive closure of the following relation using Warshall's algorithm.



- c) Determine whether the function $f : \mathbb{C} \rightarrow \mathbb{R}$ defined by $f(x + iy) = x$ is bijective or not?

Q.2 Attempt **ANY TWO** of the following: **[12]**

- a) If $z_1, z_2 \in \mathbb{C}$ then prove that $|z_1 + z_2| \leq |z_1| + |z_2|$.
- b) Solve the equation $x^7 + 1 = 0$.
- c) Using De Moivre's theorem find all the values of $(1 + i\sqrt{3})^{3/4}$.

Q.3 Attempt **ANY TWO** of the following: **[12]**

- a) Find g.c.d. of 4999 and 1109. Also express the g.c.d. in the form $4999m + 1109n$.
- b) Show that :
 - i) If $(a, c) = 1$ and $a \mid bc$ then $a \mid b$.
 - ii) If $a \mid b$ and $b \mid a$ then $b = \pm a$.

- c) Let $H = \begin{bmatrix} 1 & 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$ be a parity check matrix for Hamming (7, 4)

code. Decode the following received words 1100001, 1110111.

P.T.O.

Q.4 Attempt **ANY THREE** of the following: **[12]**

- a) Find the loci of point z satisfying the relation $|z - 2| = 2|z - 1|$.
- b) If $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = x^2 + 4x + 2$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $g(x) = 3x + 2$ then find: **i)** fog **ii)** gof.
- c) Explain how to find g.c.d. of two integers a and b by using Euclid's algorithm.
- d) Find all the code words of the code determined by the parity check matrix
- $$H = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}.$$

Q.5 Attempt **ANY FOUR** of the following: **[12]**

- a) Find the modulus and argument of $z = \frac{i - i^2 + i^3 + i^4}{i^5 + i^6 + 2}$.
- b) If $z_1 = 1 - i$, $z_2 = -2 + 4i$ and $z_3 = \sqrt{3} - 2i$.
Evaluate: $\left| \frac{z_1 + z_2 + 1}{z_1 - z_2 + i} \right|$.
- c) Let $A = \{a, b, c, d, e\}$, let R be the relation on A whose $M(R)$ is as follows:
- $$M(R) = \begin{matrix} & \begin{matrix} a & b & c & d & e \end{matrix} \\ \begin{matrix} a \\ b \\ c \\ d \\ e \end{matrix} & \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$
- Draw the diagraph of R .
- d) If $(a, m) = (b, m) = 1$ then prove that $(ab, m) = 1$.
- e) Find the minimum distance 'd' for the following code:
 $C = \{1101, 1001, 0110, 1110\} \text{ IN } \mathbb{Z}_2^4$.
- f) Define :
- i)** reflexive relation **ii)** symmetric relation **iii)** transitive relation.

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