F.Y. B. SC. (COMPUTER SCIENCE) SEM – I (CBCS - 2016 COURSE) : SUMMER - 2018

SUBJECT: ALGEBRA-I

Day: Friday **Time:** 11.00 A.M. TO 02.00 PM

Date: 20/04/2018 **S-2018-0795** **Max. Marks: 60**

N.B.:

1) All questions are **COMPULSORY**.
2) Non - programmable calculator is allowed.

Q.1 **A)** Select the correct alternative **(06)**

a) A relation R on set A is said to be antisymmetric if aRb and bRa ⇒ ____

i) aRa and bRb ii) a = b
iii) a = - b iv) a = ± b

b) Fermat's theorem states if p is a prime number and $a \in Z$ is not divisible by p then

i) $a^P \equiv 1\ (modp)$ ii) $a^{P-5} \equiv 1\ (modp)$
iii) $a^{P-3} \equiv 1(modp)$ iv) $a^{P-1} \equiv 1(modp)$

c) In Z_3 $(\overline{100})$ =

i) $\bar{0}$ ii) $\bar{1}$
iii) $\bar{2}$ iv) None of these

d) Imaginary part of $z = \frac{i-i^2+i^3+i^4}{i^5+i^6+2}$ = _____

i) 1 ii) 2
iii) -1 iv) -2

e) Polar form of complex number is _____

i) $r(cos\theta + isin\theta)$ ii) $r(sin\theta + icos\theta)$
iii) $r(cos\theta - isin\theta)$ iv) $r(sin\theta - icos\theta)$

f) Least common multiple of (121, 335) is _____

i) 3111 ii) 4121
iii) 4235 iv) None of these

g) M(R) = 0 if and only if R is _____

i) Empty ii) Cannot say
iii) Sometime empty iv) Non empty

B) Attempt all the following: **(06)**

a) Define Equivalence class.

b) Check whether the following function $f(x) = -x + 2$ is onto or not.

c) Write definition of least common multiple

d) Prepare composition table for$(Z_5, +_5)$.

e) Find real and imaginary part of $Z = 3 - i$.

f) Find the Hamming distance between x = 1010101 and y = 0011100

P.T.O.

Q.2 Attempt any **THREE** of the following: **(12)**

a) Obtain remainder when 8^{103} is divisible by 13 using Fermat's theorem.

b) Prove that if c|ab and (b, c) = 1 then c|a.

c) Prove that if $x, y, z \in B^m$ then

i) $\delta(x,y) \geq 0$ ii) $\delta(x,y) = 0$ iff $x = y$

d) Find modulus and argument of $z = \frac{3-i}{2+i} + \frac{3+i}{2-i}$

Q.3 Attempt any **FOUR** of the following: **(12)**

a) Obtain f^{-1} of function $f: R \to R$ such that $f(x) = \frac{4x-3}{2}$.

b) Check whether the function $f(n) = 2^n$ is one - one or not

c) Find minimum distance d for the following code
C ={10000, 01010, 00001} in Z_2^5.

d) If Z_1 and Z_2 are complex numbers then show that
$|Z_1 + Z_2|^2 + |Z_1 - Z_2|^2 = 2|Z_1|^2 + 2|Z_2|^2$

e) Obtain fog if $f: R \to R$ such that $f(x) = x^2 - 1$ and $g: R \to R$ such that $g(x) = \frac{3x-4}{10}$

Q.4 Attempt any **TWO** of the following: **(12)**

a) Prove that R is equivalence relation, let R be a relation on Z defined by xRy if and only if $3x + 4y$ is divisible by 7, for $x, y, \in Z$

b) Find transitive closure of R using Warshall's algorithm if R = {(1, 3), (2,1), (2,4), (3,3), (4,1), (4, 2)} be a relation on set A ={1, 2, 3, 4}

c) Solve $x^4 - x^3 + x^2 - x + 1 = 0$ using Demoivre's theorem.

Q5 Attempt any **TWO** of the following: **(12)**

a) Find g.c.d of 4999 and 1109 and express the g.c.d. in the form 4999m +1109n

b) Prove that 5^n-1 is divisible by for n≥1 by using first principle of mathematical induction.

c) Construct a decoding table with syndroms for a group code given by generator matrix $G = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$ use the table to decode the received word 10010.

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