F.Y. B. SC. (Computer Science) SEM – I (CBCS - 2016 COURSE) :
SUMMER - 2019
SUBJECT: ALGEBRA – I

Day: Saturday
Date: 04/05/2019

S-2019-1073

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.

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

1) Euclid's lemma states if p is a prime integer, $a, b \in \mathbb{Z}$ then $p \mid ab \Rightarrow$ ______.

a) $p \nmid a$ or $p \nmid b$ b) $p \nmid a$ or $p \mid b$
c) $p \mid a$ and $p \nmid b$ d) $p \mid a$ and $p \mid b$

2) Least common multiple of (60, 9) is ____________.

a) 180   b) 120   c) 9   d) 60

3) Modulus of complex number is defined as _________.

a) $r = \sqrt{x^2 - y^2}$ b) $r = \sqrt{x^2 + y^2}$ c) $r = x^2 + y^2$ d) $r = x^2 - y^2$

4) Real part of $\mathbb{Z} = -8i$ is _______.

a) 9   b) -8   c) 0   d) none of these

5) If $R = \phi$ then R is known as __________________.

a) void relation   b) universal relation
c) identity relation   d) none of these.

6) The surjective function means a function is ______________.

a) both one – one and onto   b) only onto
c) only one – one   d) neither one - one nor onto

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

1) Define partial order relation.
2) Show that a function $f : \mathbb{N} \to \mathbb{N}$ defined by $f(n) = 2^n$ is one-one.
3) Express $z = -1 + 3i$ into polar form.
4) Prepare composition table for (Z_5, X_5)
5) Define relatively prime integers.
6) Define parity check matrix.

P. T. O.

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

a) If $a,b,m \in \mathbb{Z}$ and $(a,m)=(b,m)=1$ then $(ab,m)=1$

b) Prove that $\sqrt{5}$ is not a rational number.

c) Find fifth roots of -1.

d) Expand sin 5θ in a series of sines of multiples of θ .

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

a) Draw the diagraph of the relation R given by aRb if and only if $a+b \le 5$, where $A=\{1,2,3,4,8\}=B$.

b) If $f:\mathbb{R}\to\mathbb{R}$, $g:\mathbb{R}\to\mathbb{R}$ are defined by
$f(x)=x^2+2x+3$ and $g(x)=2x+3$ respectively then obtain:
i) fog ii) gof

c) Find the minimum distance d for the following code.
$C=\{1101, 1001, 1001, 0110, 1110\}$ in $\mathbb{Z}_2^4$.

d) If $\mathbb{Z}_{11}$ is set of residue classes modulo 11, then find the values of
$i)\left(-\bar{2}\right)^5$ $ii)\left(\bar{8}+_{11}\bar{7}\right)$

e) If $|z|=1$ and $\arg z=\theta$ then prove that $\dfrac{1+z}{1-z}=i\cot\left(\dfrac{\theta}{2}\right)$.

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

a) State De - Moivre's theorem and prove any two cases.

b) Let $A=\{0,1,2,3\}$ and
$R=\{(0,0),(1,1),(2,2),(3,3),(1,2),(2,1),(3,2),(2,3),(3,1),(1,3)\}$.
show that R is an equivalence relation on A. Find equivalence class of each element.

c) Find the matrix of transitive closure for
$$M(R)=\begin{bmatrix}1&0&0&1\\1&1&0&0\\0&0&1&0\\0&0&0&1\end{bmatrix}$$ using Warshall's algorithm.

Q.5 Attempt any **TWO** of the following: **(12)**

a) Find the g.c.d. of 3927 and 377 and express the g.c.d. in the form 3927m + 377n.

b) If $a,b,c,d \in \mathbb{Z}$, $n\in\mathbb{N}$
$a\equiv b(\bmod n)$ and $c\equiv d(\bmod n)$ then,
S.T. $i)(a+c)\equiv(b+d)(\bmod n)$
$ii)(a-c)\equiv(b-d)(\bmod n)$

c) Construct a decoding table with syndromes 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 11110.

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