REV-00
BSE/08/14

2014/01

**B.Sc. ELECTRONICS**
**First Semester**
**Mathematics-I**
**(BSE- 04)**

**Duration: 3Hrs.** **Full Marks: 70**

**Part-A (Objective) =20**
**Part-B (Descriptive)=50**

**(PART-B: Descriptive)**

**Duration: 2 hrs. 40 mins.** **Marks: 50**

**1. Answer the following questions** (any *five*) **2×5=10**

*a)* Define rank of a matrix.

*b)* Expand ----

$$(1-x^3)^6$$

*c)* Express into a+ib form---

$$(1-i)\left(1+\frac{1}{i}\right)$$

*d)* Find the modulus of (1-i)(2-i)

*e)* If α,β,ϒ are the roots of the equation

$$3x^3+2x-10=0,$$

find $\sum\alpha$, $\sum\alpha\beta$.

*f)* Resolve into factors

$$\frac{2x+5}{(x-1)(x-2)}$$

*g)* Find the middle term of

$$\left(\frac{x}{a}+\frac{a}{x}\right)^{10}$$

**2. Answer the following questions** (any *five*) **3×5=15**

*a)* Reduce into A+iB form ---

$$\frac{(2+i)^2}{3+2i}$$

*b)* Prove that

$$(\cos3\theta+i\sin3\theta)(\cos\theta-i\sin\theta)=\cos\theta+i\sin\theta$$

*c)* Solve the equation

$$27x^3+42x^2-28x-8=0$$

whose roots are in GP

*d)* If $\alpha,\beta,\Upsilon$ are the roots of the equation $x^3+p_1x^2+p_2x+p_3=0$, form the equation whose roots are multiplied with the same constant 'm'.

*e)* Without expanding show that

$$\begin{vmatrix} b+c & c+a & a+b \\ q+r & p+q & p+q \\ x+y & z+x & x+y \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$$

*f)* Find the term independent of x in the expansion of $(x+\frac{1}{x})^{10}$.

*g)* Compute AB where $A=\begin{bmatrix} 2 \\ 4 \\ 0 \end{bmatrix}$ and $B=\begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$

**3. Answer the following questions** (any *five*) **5×5=25**

*a)* Expand $\cos5\theta$ in the powers of $\cos\theta$.

*b)* Solve the equation

$$x^3-3x^2-6x+8=0,$$

whose roots are in AP.

*c)* If $\alpha,\beta,\Upsilon$ are the roots of the equation $x^3+px+q=0$, find $\sum\frac{1}{\alpha+\beta}$.

*d)* Solve the following system by crammers rule---

$$x+y+z=4$$
$$2x-y+3z=1$$
$$3x+2y-z=1$$

*e)* Find the inverse of

$$\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$$

*f)* With usual notations prove that

$$C_1 + 2C_2 + 3C_3 + \cdots + nC_n = n.2^{n-1}$$

*g)* If $y = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots$,

show that $x = y + \frac{y^2}{2!} + \frac{y^3}{3!} + \cdots$

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*(The figures in the margin indicate full marks for the questions)*

**Duration: 20 minutes** **Marks – 20**

## PART A- Objective Type

**1. Choose the correct option.** **1×10=10**

(i) The amplitude of the complex number z = x+iy is
- (a) $\sqrt{x^2 + y^2}$
- (b) x+y
- (c) $\tan^{-1}\frac{x}{y}$
- (d) $\tan^{-1}\frac{y}{x}$

(ii) The real part of $\frac{(2+i)^2}{3+i}$ is
- (a) $\frac{17}{13}$
- (b) $\frac{6}{13}$
- (c) $\frac{2}{5}$
- (d) $\frac{2}{3}$

(iii) The value of $i + \frac{1}{i}$ is
- (a) i
- (b) –i
- (c) 0
- (d) 1

(iv) The value of cos π+isin π is
- (a) 1
- (b) -1
- (c) 0
- (d) i

(v) If f(x)= $x^3$-3$x^2$+4x-5 , the value of f(-1) is
- (a) 1
- (b) 16
- (c) 18
- (d) 20

(vi) If $\alpha, \beta, \Upsilon$ are the roots of the equation $ax^2+bx+c=0$, the value of $\sum\alpha\beta$ is

(a) –b

(b)$\frac{c}{a}$

(c) –c

(d) $\frac{-c}{a}$

(vii) If A and B are two matrices of same order, then

(a) AB=BA always

(b) AB≠BA always

(c) AB>BA always

(d) AB=BA never

(viii) The binomial coefficient in the expansion of $(1+x)^n$ is

(a) $2^n$

(b) $2^n -1$

(c) $2^n+1$

(d) $2^{n-1}$

(ix) The coefficient of the nth term in the expansion of $e^x$ is

(a) 1

(b) $\frac{1}{n!}$

(c) $\frac{1}{(n-1)!}$

(d) $\frac{1}{(n-21)!}$

(x) The value of e

(a) 2

(b) 2

(c) lies between 1 and 2

(d) lies between 2 and 3

**2. Answer the followings---** **1×10=10**

(i) Write the binomial theorem for a positive integral index.

(ii) Write the general term of $(3-x^2)^6$.

(iii) Write the conjugate of x-2i.

(iv) Simplify---- $i^6$

(v) What is the value of $(\cos\theta+i \sin\theta)^{-n}$

(vi) Write the expression for $e^x$

(vii) If $\alpha$ and $\beta$ are the roots of a quadratic equation, write the equation in terms of $\alpha$ and $\beta$.

(viii) What is the rank of a null matrix?

(ix) What is the necessary and sufficient condition for a matrix A to possesses its inverse.

(x) What is the total no of terms in the expansion of $(a+x)^n$

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