35134/A 340

Reg. No. [ ]

First Semester B.Sc. 3 Degree Examination, Nov./Dec. 2016
MATHEMATICS (Optional)
Paper – II : Algebra and Trigonometry
(Fresh and Repeater New Syllabus)

Time : 3 Hours Max. Marks : 80

Instructions : *1) Question paper contains* ***three*** *Parts namely* ***A, B*** *and* ***C.***
2) Answer ***all*** *questions.*

PART – A

1. Answer **any ten** of the following : **(10×2=20)**

a) Define :

i) Reciprocal determinant

ii) Symmetric determinant.

b) Find the co-factor of an element 2 in the determinant

$$\begin{vmatrix} 3 & -1 & 0 & 1 \\ 0 & 3 & 1 & 0 \\ 4 & 2 & 5 & 8 \\ 1 & 8 & 0 & 1 \end{vmatrix}$$

c) Find the rank of $\begin{vmatrix} 2 & 3 & 5 \\ 1 & 0 & 2 \\ 4 & 6 & 10 \end{vmatrix}$

d) Define elementary raw transformation of a matrix.

e) Define :

i) Consistency

ii) Inconsistency of the non-homogeneous linear equations.

f) Define an equivalence relation.

g) Show that the set of even integer is countable.

h) Find the remainder on dividing $x^4 + 2x^3 - 3x^2 + 5x - 10$ by $x + 3$.

P.T.O.

i) State the fundamental theorem of algebra.

j) If r_1, r_2 and r_3 are the roots of the equation $x^3 - 3x^2 + 2x - 1 = 0$ then find the value of $r_1^2 + r_2^2 + r_3^2$.

k) Express $\cos(x + iy)$ in the form A+ iB.

l) Evaluate $\log_e(-1 + i\sqrt{3})$.

PART – B

Answer **any four** of the following : **(4×5=20)**

2. Prove that $\begin{vmatrix} x+a & b & c & d \\ a & x+b & c & d \\ a & b & x+c & d \\ a & b & c & x+d \end{vmatrix} = x^3(x + a + b + c + d)$

3. Find the rank of matrix $\begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{bmatrix}$ by reducing it to normal form.

4. Prove that the rank of matrix does not alter, by multiplying the elements of a row by non-zero scalar.

5. Prove that the unit interval [0, 1] is uncountable.

6. Find the value of k and solve the equation $x^3 + 2x^2 + kx - 6 = 0$, given that the sum of two of the roots is – 4.

7. Express $\sin^5\theta$ in series of sine multiples of θ.

PART – C

Answer **any four** of the following : **(4×10=40)**

8. a) If Δ is a determinant of order 4 and Δ' is reciprocal of Δ, then prove that $\Delta' = \Delta^3$.

b) Prove that $\begin{vmatrix} o & x & y & z \\ -x & o & c & b \\ -y & -c & o & a \\ -z & -b & a & o \end{vmatrix} = (ax - by + cz)^2$.

9. a) Find the inverse of $A = \begin{bmatrix} 3 & 5 & 7 \\ 2 & -3 & 1 \\ 1 & 1 & 2 \end{bmatrix}$ by using elementary transformation.

b) Solve the system of equations $x + 2y + 3z = 6$, $2x + y - z = 3$, $3x - y + 2z = 11$ by using elementary transformations.

10. a) With usual notations prove that

i) $\left(\bigcap_{\lambda \in \Lambda} A_\lambda\right)' = \bigcup_{\lambda \in \Lambda} A'_\lambda$ ii) $\left(\bigcup_{\lambda \in \Lambda} A_\lambda\right)' = \bigcap_{\lambda \in \Lambda} A'_\lambda$

b) Prove that the set $N \times N$ is countable.

11. a) Prove that every polynomial equation

$f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots + a_{n-1}x + a_n = 0$ has exactly n roots.

b) Find the roots of equation $f(x) = 4x^4 - 7x^2 = 5x - 1$.

12. a) If $\sin(A + iB) = x + iy$, then prove that

i) $\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1$ ii) $\frac{x^2}{\sin^2 A} - \frac{y^2}{\cos^2 A} = 1$

b) Sum to n terms of the series

$\cos\alpha + x\cos(\alpha + \beta) + x^2\cos(\alpha + 2\beta) + \ldots$
