(6 pages) Reg. No. : .....

Code No. : 20072 E **Sub. Code : SAMA 11/ AAMA 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2023.

First/Third Semester

Mathematics – Allied

ALGEBRA AND DIFFERENTIAL EQUATIONS

(For those who joined in July 2017 – 2020)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. If $3+\sqrt{2}$ is a root of $x^3-11x^2+37x-35=0$ then _____ is also a root of it.

(a) $\sqrt{3}+\sqrt{2}$ (b) $\sqrt{3}-\sqrt{2}$

(c) $3-\sqrt{2}$ (d) none

2. If α, β, γ are the roots of $3x^3+6x^2-9x+2=0$ then $\alpha\beta\gamma =$ _____.

(a) $\frac{2}{3}$ (b) $-\frac{2}{3}$

(c) 2 (d) -2

3. The equation obtained by multiplying the roots of the equation $x^3+3x^2+x-4=0$ by 10 is _____.

(a) $x^3-30x^2+10x-40=0$

(b) $10x^3+30x^2+100x-4=0$

(c) $x^3+30x^2+100x-400=0$

(d) $x^3+30x^2+100x-4000=0$

4. A positive root of $x^3-3x+1=0$ lies between _____.

(a) 1 and 2 (b) 2 and 3

(c) 3 and 4 (d) 4 and 5

5. If rank (A) = rank (A, B) = the number of unknowns, then the system of equations $AX=B$ has _____ solutions.

(a) infinite (b) no

(c) unique (d) none

6. The sum of the eigen values of the matrix $\begin{pmatrix} 3 & 1 & 5 \\ 0 & 4 & 2 \\ 0 & 0 & -1 \end{pmatrix}$ is _____.

(a) 3 (b) 2

(c) 4 (d) 6

7. The general solution of the equation $y=px+p^2$ is

(a) $y=cx+p^2$ (b) $y=cx+c^2$

(c) $y=cx-c^2$ (d) none

8. An equation solvable for x is of the form

(a) $x=px+f(p)$ (b) $y=f(x,p)$

(c) $x=f(y,p)$ (d) none

9. $L[x]=$ _____.

(a) $\frac{1}{s}$ (b) s

(c) s^2 (d) $\frac{1}{s^2}$

10. $L^{-1}\left[\frac{1}{s-a}\right]=$ _____.

(a) e^{ax} (b) e^{-ax}

(c) x (d) x^2

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Solve the equation $x^3-11x^2+37x-35=0$ if one of its roots is $3+\sqrt{2}$.

Or

(b) Solve the equation $x^3-12x^2+39x-28=0$ given that the roots are in A.P.

12. (a) Diminish the roots of the equation $x^4+3x^3-2x^2-4x-3=0$ by 3.

Or

(b) Show that the equation $x^3+3x-1=0$ has only one real root and calculate it correct to two places of decimals.

13. (a) Test the consistency of the following system of linear equations. If consistent solve it.

$x+y+z=3; 2x+y-z=2; 4x-y+2z=5$

Or

(b) Find the eigen values of the matrix $A=\begin{pmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$.

14. (a) Solve $p^2 - 5p + 6 = 0$.

Or

(b) Solve $\sin px \cos y = \cos px \sin y + p$.

15. (a) Find $L[x^2 e^{-ax}]$.

Or

(b) Find $L^{-1}\left[\frac{s+1}{s^2+2s+2}\right]$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Show that the roots of the equation $px^3 + qx^2 + rx + s = 0$ are in A.P iff $2q^3 + 27p^2 s = 9pqr$.

Or

(b) Solve $6x^5 + 11x^4 - 33x^3 - 33x^2 + 11x + 6 = 0$.

17. (a) Find the root of the equation $x^4 - 3x + 1 = 0$ that lies between 1 and 2 correct to two decimal places using Newton's method.

Or

(b) Find the positive root of $x^3 + 2x^2 - 5x - 7 = 0$ correct to 2 decimal places by Horner's method.

18. (a) Test the consistency of the equations $x - y + z = 2$; $3x - y + 2z = -6$; $3x + y + z = -18$ and solve if consistent.

Or

(b) Find the eigen values and the eigen vectors of the matrix $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$.

19. (a) Solve : $xp^2 - 2yp + x = 0$.

Or

(b) Solve : $y - 2px = x^2 p^4$.

20. (a) Find $L\left(\frac{1-\cos x}{x}\right)$.

Or

(b) Find :

(i) $L^{-1}\left[\frac{s}{(s+2)^2}\right]$

(ii) $L^{-1}\left[\frac{1}{(s+3)^2+25}\right]$.