

NG 16 (GROUP A)

PART AA — ENGINEERING MATHEMATICS

(Common to all candidates)

(Answer ALL questions)

- If $A = \begin{pmatrix} 1 & -2 \\ -5 & 4 \end{pmatrix}$, then the eigenvalues of $\text{adj}(A)$ are

 - 1, -6
 - 1, 6
 - 1, 1/6
 - 1, 6
- A system of equations $x + y + z = 6$, $x + 2y + 3z = 10$ and $x + 2y + kz = 5$ has no solution if the value of 'k' is

 - 5
 - 3
 - 4
 - 1
- If the matrix $A = \begin{pmatrix} -1 & 3 \\ 2 & 4 \end{pmatrix}$ satisfies its own characteristic equation, then the matrix $A^4 - 3A^3 - 10A^2 + 3A + 2I$ is of the form

 - $\begin{pmatrix} -1 & 9 \\ 6 & 14 \end{pmatrix}$
 - $\begin{pmatrix} -5 & 9 \\ 6 & 10 \end{pmatrix}$
 - $\begin{pmatrix} 1 & 3 \\ 2 & 6 \end{pmatrix}$
 - $\begin{pmatrix} 0 & 3 \\ 2 & 5 \end{pmatrix}$
- If $x = u(1+v)$ and $y = v(1+u)$, then the Jacobian of x, y with respect to u, v is given by

 - $2u + v + 1$
 - $u + 2v + 1$
 - $u + v + 1$
 - $u - v + 1$
- The possible extreme point of a function $f(x, y) = x^2 + y^2 + \frac{2}{x} + \frac{2}{y}$ is

 - (0, 0)
 - (-1, -1)
 - (1/3, 1/3)
 - (1, 1)
- The nature of the stationary point (1, 1) of the function $f(x, y) = (xy)^3$ is

 - a saddle point
 - a minimum point
 - a maximum point
 - an invariant point

7. By eliminating x from the simultaneous linear equations $\frac{dx}{dt} + 2y = 0$, $\frac{dy}{dt} - 2x = 0$, the differential equation is of the form

1. $\frac{d^2y}{dt^2} = 4y$
2. $\frac{d^2y}{dt^2} = 2y$
3. $\frac{d^2y}{dt^2} + 4y = 0$
4. $\frac{d^2y}{dt^2} + 2y = 0$

8. The particular integral of $(D^2 - 4D + 13)y = e^{2x} \cos 3x$ is

1. $x e^{2x} \sin 3x$
2. $\frac{1}{6} x e^{2x} \sin 3x$
3. $\frac{1}{3} x e^{2x} \sin 3x$
4. $\frac{1}{18} e^{2x} \cos 3x$

9. The value of the integral $\int_C (y^2 dx - x^2 dy)$, where C is the boundary of the triangle whose vertices are $(-1, 0)$, $(1, 0)$ and $(0, 1)$ is

1. $\frac{1}{3}$
2. $\frac{2}{3}$
3. $\frac{3}{2}$
4. $-\frac{2}{3}$

10. The work done by the force $\vec{F} = 3x\vec{i} + 4y\vec{j}$ when it moves a particle on the curve $2y = x^2$ from $(0, 0)$ to $(2, 2)$ is

1. 14
2. 2
3. 6
4. 8

11. If $v = x^3 - kxy^2 + 3x + 5$ is the imaginary part of a function $f(z) = u + iv$, then v is harmonic only when ' k ' is equal to

1. -3
2. 3
3. 2
4. -1

12. The invariant point of the transformation $w = \frac{3z - 5i}{iz - 1}$ is given by

1. $5i$
2. $-i$
3. $-5i$
4. 1

13. The value of the integral $\int_C \frac{dz}{(z-2)^2}$, where C is the circle whose centre is 2 and radius 4 is

1. $2\pi i$
2. $4\pi i$
3. $-2\pi i$
4. 0

14. The partial differential equation by eliminating the arbitrary function 'f' from $z = f\left(\frac{x}{y}\right)$ is of the form
1. $py + qx = 0$
 2. $px + qy = 0$
 3. $qx - py = 0$
 4. $qy = px = 0$
15. If $L\{f(t)\} = \frac{1}{s(s+a)}$, then $f(t)$ is equal to
1. ae^{-at}
 2. $(1 - e^{-at})$
 3. $\frac{1}{a}(1 - e^{-at})$
 4. $\frac{1}{a}e^{-at}$
16. If $F(s)$ is the Fourier transform of a function $f(x)$, then the Fourier transform of $f(2x)$ is
1. $F(s-2)$
 2. $e^{2is}F(s)$
 3. $\frac{1}{2}F(2/s)$
 4. $\frac{1}{2}F(s/2)$
17. The Z-transform of the unit step function $u(n) = \begin{cases} 0 & \text{if } n < 0 \\ 1 & \text{if } n \geq 0 \end{cases}$ is
1. $z-1$
 2. $\frac{z}{z-1}$
 3. $\frac{1}{z-1}$
 4. 1
18. In solving the system $Ax = B$ of linear equations by Gauss Jordan method, the coefficient matrix A is reduced to
1. symmetric matrix
 2. orthogonal matrix
 3. diagonal matrix
 4. null matrix
19. The probability density function of a continuous random variable X is given by $f(x) = \begin{cases} (k/x^3) & \text{if } 5 \leq x \leq 10 \\ 0 & \text{otherwise} \end{cases}$. Then the value of 'k' is
1. $\frac{3}{200}$
 2. $\frac{200}{3}$
 3. 200
 4. 40
20. The moment generating function about the origin of a Binomial distribution with 'n' observations, probability of success 'p' and probability of failure 'q' is of the form
1. $(pe^t + q)^n$
 2. $(1 + pe^t)^n$
 3. $(pe^t + q)^{-n}$
 4. $(pq + e^t)^n$