Group – I (SEC-B)

S$_{2(UMA12B13, DTMA12B12)}$ All

B.Tech. 2nd Semester End-Term Examination 2021
Subject Name: Engineering Mathematics – II
Subject Code: UAD12B13, DTPH12B12

Full Marks: 50   Answer scripts to be submitted through email: nita.ma.btech.b1@gmail.com   **Time: 2 Hours**
Symbols Used Here Have Their Usual Meanings

Choose the correct option from the following: [10 × 2 = 20 Marks]

1. If the vector $\bar{F} = (xyz)^b(x^a\hat{i} + y^a\hat{j} + z^a\hat{k})$ is an irrotational vector, then the values of a and b are respectively

a) 0 and −1
b) −1 and 0
c) 2 and 3
d) None of these

2. At the origin, the function $f(z) = \sqrt{|xy|}$ is?

a) Analytic
b) not analytic
c) Differentiable
d) none of these

3. If $f(z) = \frac{\sin(z-1)}{(z-1)^4}$ then the residue at $z = 1$ is

a) 1
b) $\frac{1}{6}$
c) $-\frac{1}{2}$
d) None of these.

4. If $\varphi = 2x^2 + 3y^2 + 4z^2$, then curl(grad φ) is given by

a) 1
b) 2
c) 0
d) None of these

5. The directional derivative of $\emptyset = x^2yz + 4xz^2$ at $(1,-2,-1)$ in the direction of $2\hat{i} - \hat{j} - 2\hat{k}$ is

a) $\frac{37}{\sqrt{3}}$
b) $\frac{61}{\sqrt{3}}$
c) $\frac{55}{\sqrt{2}}$
d) None of these

6. The value of the integral $\int_0^\infty \int_0^\infty \frac{e^{-y}}{y} dydx$ is

a) 0
b) 1
c) -1
d) $\frac{1}{2}$

7. For which of the following values of a, the vectors $(1,2,1), (a,3,1), (2,a,0)$ in R^3 are linearly dependent?

a) $2, -1$
b) $2, 1$
c) $-2, 1$
d) $-2, -1$

8. The principal value of $Log(-\frac{1}{2} - \frac{1}{2}i\sqrt{3})$ is

a) $\frac{1}{2}log2 + \frac{1}{4}\pi i$
b) $\frac{4}{3}\pi i$
c) $\frac{1}{2}log2 - \frac{1}{4}\pi i$
d) $\frac{1}{2}log2 + \frac{3}{4}\pi i$

9. The poles of the function $f(z) = \tan\left(\frac{1}{z}\right)$ are

a) $z = 2n\pi \pm \frac{\pi}{2}$
b) $z = 2n\pi + \frac{\pi}{2}$
c) $z = \frac{1}{2n\pi\pm\frac{\pi}{2}}$
d) $z = 2n\pi - \frac{\pi}{2}$

10. The value of $\int_0^{\frac{\pi}{2}} \sqrt{cot\theta} d\theta$ is

a) $\frac{\pi\sqrt{2}}{2}$
b) $\frac{\pi}{2}$
c) $\frac{\pi\sqrt{2}}{4}$
d) None of these

Choose the correct option from the following: [10 × 3 = 30 Marks]

11. Using the transformation $x + y = u$, $y = uv$, the value of the integral $\int_0^\infty \int_0^\infty e^{-(x+y)}x^{p-1}y^{q-1}dxdy$ is equal to

a) pq
b) $\Gamma(p)\Gamma(q)$
c) $\Gamma(p+1)\Gamma(q-1)$
d) None of these

12. The value of the integral $\iiint(x+y+z)dxdydz$ over the tetrahedron bounded by the planes $x = 0, y = 0, z = 0$ and $x + y + z = 1$ is

a) $\frac{1}{16}$
b) $\frac{1}{8}$
c) $\frac{1}{9}$
d) None of these

13. The eigen values for the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ are

a) 5, 1, 2
b) 5, 1, 1
c) 5, 2, 1
d) 6, 1, 1

14. The value of the line integral $\int_c \vec{F}.\vec{dr}$ where $\vec{F} = 2x\,\vec{i} + y^2\vec{j}$ and C is the path from the point $(1,-2)$ to the point $(2,-1)$

a) $\frac{3}{2}$
b) $\frac{16}{3}$
c) $\frac{1}{2}$
d) None of these

15. The rate of change of $f = x^2y + yz^2$ at $(1,-1,2)$ in the direction of the normal to the surface $x^2 + y^2 = z + 4$

a) $\frac{20}{\sqrt{21}}$
b) $\frac{14}{\sqrt{19}}$
c) $\frac{-13}{\sqrt{29}}$
d) None of these

16. If $A = \begin{pmatrix} 1 & 0 \\ 2 & 4 \end{pmatrix}$ then eigen values of $4A^{-1} + 3A + 2I$ are

a) $6, 15$
b) $9,12$
c) $9,15$
d) None of these

17. The value of the integral $\int_{|z|=1} \frac{dz}{z\sin z}$ is

a) $2\pi i$
b) $-2\pi i$
c) 0
d) None of these

18. The real part of the analytic function $w = u + iv$ is $x^3 - 3xy^2 + 3x^2 - 3y^2$ then the value of the imaginary part will be

a) $y^3 - 3xy^2 - 3y^2 + c$
b) $3x^2y + 6xy - y^3 + c$
c) $y^3 - 3xy^2 + 3x^2 - x^2y^2 + c$
d) None of these.

19. If $A = \begin{bmatrix} 4 & 3 & 1 \\ 2 & 1 & -2 \\ 1 & 2 & 1 \end{bmatrix}$, then the value of $A^3 - 6A^2 + 8A - 12I$ in matrix form is

a) $A^2 - I$
b) $2A - I$
c) $2A + I$
d) None of these.

20. If the force field $\bar{F} = 3x^2y\hat{i} + (x^3 - 2yz^2)\hat{j} + (3z^2 - 2y^2z)\hat{k}$ is conservative, then the Scalar potential $\emptyset$ is equal to

a) $y^2z^2 + x^3y + c$
b) $z^3 - y^2z^2 + c$
c) $x^3y + z^3 - y^2z^2 + c$
d) None of these