Subject : Mathematics - I
EAS-103

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OBJECTIVE TYPE QUESTION

(Note : 1 (ONE) Marks for each question)

1. The n^{th} derivative of 4^x is -

(I) $4^x(\log 4)^{n-1}$ (II) $4^x(\log 4)^n$

(III) $x^4(\log 4)^n$ (iv) Non of these

2. If $u = x \log xy$, where $x^3+y^3+3xy = 1$ Find $\frac{du}{dx}$.

(I) $\frac{du}{dx} = 1 + \log xy - \frac{x}{y}\left(\frac{x^2+y}{x+y^2}\right)$

(II) $\frac{du}{dx} = \log xy + \left(\frac{x^2+y^2}{x+y^2}\right)\frac{y}{x}$

(III) $\frac{du}{dx} = 1 + \left(\frac{x+y^2}{x^2+y}\right)\log(xy)$

(iv) $\frac{du}{dx} = \frac{x}{y} + \log(xy) - \frac{x}{y}\left(\frac{x^2+y}{x+y^2}\right)$

3. If $x = r\cos\theta$, $y = r\sin\theta$, $\frac{\partial(r,\theta)}{\partial(x,y)}$ is

(I) $\frac{1}{r^2}$ (II) $\frac{1}{r}$, (III) $\frac{1}{\sqrt{r}}$ (iv) $\sqrt{r}$

4 The quantity Q of water flowing over a V-natch is given by the formula $Q = CH^{5/2}$, where H is the head of water and C is constant. Find error in Q if the error in H is 1.5 %. The error in Q is -

(I) 4.75 % (II) 2.52 % (iii) 3.75 % (iv) 5.75 %

5. The density of the atmosphere at height z metres is given by $\rho = \rho_0 e^{-z/800}$, where ρ_0 is the density at the sea level. Find the approximate increase in height corresponding to a fall of 1 % in the density.

(I) 6 % (II) 7 % (III) 8 % (iv) 9 %

6. A balloon in the form of right circula cylinder of radius 1.5 m. and length 4m is surmounted by hemispherical ends. If the radius is increased by 0.01 m. and the length by 0.05 m, find the %age change in the volume of the balloon. The %age increase in volume is —

(I) 3.288 (II) 1.52 (III) 2.588 (iv) 2.388

7. Rank of the matrix of A is; where $A = \begin{vmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{vmatrix}$

(I) 2 (II) 3 (III) 1 (iv) Non of these.

8. If $A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$, so the rank of A is —

(I) 2 (II) 3 (iii) 1 (iv) Non of these.

9. Test for consistency and solve $5x + 3y + 7z = 4$, $3x + 26y + 2z = 9$, $7x + 2y + 10z = 5$

(I) The system are consistent and have infinitely many solution.

(II) The System is consistent with unique solution.

(iii) The system is Inconsistent and there is no solution.

(iv) Non of these.

10. The eigen values of the matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

(I) $\lambda = 1, 1, 2$ (II) $\lambda = 1, 1, 1$ (III) $\lambda = 0, 1, 1$ (iv) 1, 2

11. The inverse matrix of $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ is —

(I) $A^{-1} = \begin{bmatrix} 1 & -3 & 2 \\ -3 & 3 & -1 \\ 2 & -1 & 0 \end{bmatrix}$ (II) $A^{-1} = \begin{bmatrix} 0 & 1 & -3 \\ -1 & 2 & 2 \\ 1 & 0 & -3 \end{bmatrix}$ (III) $A^{-1} = \begin{bmatrix} -2 & 1 & 3 \\ 2 & 1 & -1 \\ 0 & 3 & -1 \end{bmatrix}$

(iv) Non of these.

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12. The characteristic equation of A matrix is –

(i) $(A - \lambda I)$ (II) $|A - \lambda I|$ (iii) $Adj(A)\,|A - \lambda I|$

(iv) Non of these.

13. The modal matrix can find by

(I) $D = P A P^{n}$ (II) $D = P^{-1} A P$ (III) $P = D A P^{-1}$

(iv) Non of these.

14. The value of $I = \int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2)\, dy\, dx$. is –

(I) $\frac{1}{35}$ (II) $\frac{3}{35}$ (iii) $\frac{2}{41}$ (iv) 6

15. Evaluate $I = \iint_R xy\, dy\, dx$ where R is the quadrant of the circle $x^2 + y^2 = a^2$, where $x \geq 0$ and $y \geq 0$.

The I will be –

(I) a^2 (II) $\frac{a^2}{4}$ (iii) $\frac{a^3}{8}$ (iv) $\frac{a^4}{8}$

16. In polar $dx\,dy$ is to be replaced by –

(I) $J\, du\, dv$ (II) $r\, dr\, d\theta$ (III) $r\, d\theta$ (iv) Non of these.

17. Evaluate – $I = \int_0^a \int_0^{\sqrt{(a^2 - y^2)}} (a^2 - x^2 - y^2)\, dx\, dy$; The value of I is –

(I) $\frac{\pi a^4}{8}$ (II) $\frac{\pi}{8}$ (III) $\frac{\sqrt{\pi}\, a^4}{8}$ (iv) $\frac{\pi}{4}$

18. The area of the curve $r^2 = a^2 \cos 2\theta$. is –

(I) a (II) a^2 (III) a^3 (iv) a^4,

19. Evaluate $\int_0^4 \int_0^{2\sqrt{z}} \int_0^{\sqrt{4z - x^2}} dy\, dx\, dz$. The result will be.

(I) 3π (II) 5π (III) 8π (iv) 12π

20. Express the integrals in terms of Beta function.

$$\int_0^1 x^m (1-x^2)\,dx \quad , m > -1 \, , n > -1$$

(i) $\beta\left(\frac{1}{2}(m+1), n+1\right)$ (ii) $\beta((m+1), n)$

(iii) $\beta(\frac{1}{2}m, n)$ (iv) None of these.

21. The relation b/w Beta and Gamma function is –

(i) $\beta(m,n) = \frac{\lfloor m \, \Gamma n}{\lfloor m+n}$ (ii) $\beta(m,n) = \frac{\Gamma m \, \Gamma n}{\Gamma m+n}$

(iii) $\beta(m,n) = \frac{\Gamma m+n}{\Gamma m \, \Gamma n}$ (iv) None of these.

22. The Dirichlet's theorem for three variables – $\iiint x^{l-1} y^{m-1} z^{n-1}\,dx\,dy\,dz$ will be.

condition $x+y+z \le 1$

(i) $\frac{\Gamma l \, \Gamma m \, \Gamma n}{\Gamma lmn+1}$ (ii) $\frac{\Gamma l \, \Gamma m \, \Gamma n}{\Gamma l+m+n+1}$

(iii) $\frac{\Gamma l+m+n+1}{\Gamma l \, \Gamma m \, \Gamma n}$ (iv) None of these.

23. If $r = |r|$ then $\nabla \log |r| =$

(i) r^2 (ii) r/r^2 (iii) r (iv) $\sqrt{r}$.

24. The angle b/w the surfaces $x^2+y^2+z^2=9$ and $x^2+y^2-z=3$ at the point $(2,-1,2)$.

(i) $\theta = \frac{16}{6\sqrt{21}}$ (ii) $\theta = \frac{4}{\sqrt{21}}$ (iii) $\theta = \frac{1}{23}$ (iv) $\frac{\pi}{2}$

25. If $r = xi + yj + zk$, then $\nabla \times r = \boxed{?}$

(i) 3 (ii) 0 (iii) 2 (iv) 1.

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26. If $u = x^2 + y^2 + z^2$ and $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ the the div$(u\bar{r})$ in terms of u is –

(I) $2u$ (II) $3u$ (III) $4u$ (iv) $5u$

27. Evaluate $\iint_S F \cdot \hat{n}\, ds$ where $F = z\hat{i} + x\hat{j} - 3y^2z\hat{k}$ and s is the surface of the cylinder $x^2 + y^2 = 16$ included in the first octant between $z = 0$ and $z = 15$. Ans is -

(I) 30 (II) 60 (III) 90 (iv) 100

28. $I = \iiint_V (2x + y)\, dV$, wher V is the closed region bounded by the cylinder $z = 4 - x^2$ and planes $x = 0$, $y = 0$, $y = 2$ and $z = 0$.

$I = ?$

(I) $\frac{80}{3}$ (II) $\frac{80}{7}$ (III) 80 (iv) Non of these.

29. Using Green's theorem evaluate $\int_c (x^2y\,dx + x^2dy)$ where c is boundry described counter clockwise of the triangle with varies $(0,0)$, $(1,0)$ and $(1,1)$.

(I) 5 (II) $\frac{15}{7}$ (III) $\frac{5}{12}$ (iv) $\frac{5}{13}$

30. The stoke's theorem is

(I) $\oint_c \bar{F} \cdot d\bar{r} = \iint_s \text{curl } \bar{F} \cdot \hat{n}\, ds$ (ii) $\oint_c F \cdot r \cdot dr = \iint_s \text{curl } \bar{F}\, ds$.

(III) $\oint_c \bar{r}\, dr = \iint_s \text{curl } \bar{F} \cdot ds$ (IV) Non-of these.