Seat No. _____

PAPER CODE : CCL-8279

B. Sc. (Sem. 1) Examination

March – 2022

Mathematics : CC MAT-111

Total Time : 35 Minutes
Total Questions : 35

Total Marks : 50
Students need to Tick only : 25

Students need to tick only **25** questions. If more than **25** questions are ticked, the first **25** questions will only be evaluated.

1 If $y=(5x+4)^{11}$ then $y_5=$ _____.

(A) $\frac{11!}{5!}\ 5^{11}(5x+4)^{11}$ (B) $\frac{6!}{11!}\ 5^5(5x+4)^6$

(C) $\frac{6!}{5!}\ 5^6(5x+4)^5$ (D) $\frac{11!}{6!}\ 5^5(5x+4)^6$

2 $y=\log(2x+3)$ then $y_n=$ _____.

(A) $\frac{(-1)^{n-1}(n-1)!\,2^n}{(2x+3)^n}$ (B) $\frac{(-1)^{n-1}n!\,2^n}{(2x+3)^n}$

(C) $\frac{(-1)^n(n-1)!\,2^n}{(2x+3)^n}$ (D) $\frac{(-1)^{n-1}(n-1)!\,2^n}{(2x+3)^{n+1}}$

3 If $y=\sin(2021x+2022)$ then $y_{2022}=$ _____.

(A) $2022^{2021}\sin(2021x+1011\pi)$

(B) $2021^{2022}\sin(2021x+2022+1011\pi)$

(C) $2021^{2021}\sin\left(2021x+2022+2022\frac{\pi}{2}\right)$

(D) None of above

4 If $y = e^{5x}\sin(12x+5)$ and $y_n = r^n\, e^{5x}\sin(12x+5+n\phi)$, then $r =$ ____.

(A) $\sqrt{a^2+b^2}$ (B) 5

(C) 13 (D) 12

5 If $y = \sin^{-1} x$, $x \in (-1,1)$, then $(1-x^2)y_2 =$ ____.

(A) 0 (B) xy_1

(C) y_1 (D) $x^2 y_1$

6 If $I_n = \frac{d^n}{dx^n}(x^n \log x)$, then $\frac{I_n}{n!} = \frac{I_{n-1}}{(n-1)!} +$ ____.

(A) $n!$ (B) $n.n!$

(C) n (D) $\frac{1}{n}$

7 Suppose real function f and g are continuous on $[a,b]$ and differentiable on (a,b), also ____, $\forall x \in (a,b)$, then $\exists c \in (a,b)$ s.t. $\frac{f(b)-f(a)}{g(b)-g(a)} = \frac{f'(c)}{g'(c)}$.

(A) $g(x) \neq 0$ (B) $f(x) \neq 0$

(C) $g'(x) \neq 0$ (D) $g(x) = 0$

8 If $f(x) = \sin x$, $g(x) = \cos x$, $x \in [0, \frac{\pi}{4}]$ and f, g satisfy all condition of Cauchy's mean value, then $C =$ ____.

(A) $\tan^{-1}(\sqrt{2}-1)$ (B) $\cot^{-1}(\sqrt{2}-1)$

(C) $\tan^{-1}(1-\sqrt{2})$ (D) None of above

9 $\sin x =$ _____.

(A) $1+\frac{x}{1!}+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots\ldots$ (B) $x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\ldots\ldots$

C $1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+\ldots\ldots$ (D) None of above

10 For $x=\sin\theta$, $y=\cos m\theta$ and we have $\left(1-x^2\right)y_2-xy_1+m^2y=0$, then $\left(1-x^2\right)y_{n+2}-(2n+1)xy_{n+1}=$ _____ y_n.

(A) n^2 (B) n^2-m

(C) n^2-m^2 (D) m^2-n^2

11 If n is an odd no. then $\int_0^{\frac{\pi}{2}}\cos^n dx =$ _____.

(A) $\frac{n-1}{n}\cdot\frac{n-3}{n-2}\ldots\ldots\frac{2}{3}$ (B) $\frac{n-1}{n}\cdot\frac{n-3}{n-2}\ldots\ldots\frac{1}{2}\frac{\pi}{2}$

(C) $\frac{n}{n-1}\cdot\frac{n-2}{n-3}\ldots\ldots\frac{2}{3}$ (D) None of above

12 $\int_0^{\frac{\pi}{2}}\sin^8 x\,dx =$ _____.

(A) $\frac{35}{356\pi}$ (B) $\frac{356}{35}\pi$

(C) $\frac{35}{256}$ D $\frac{35}{256}\pi$

13 $\int_0^{\frac{\pi}{2}}\sin^6 x\cos^4 x\,dx =$ _____.

(A) $\frac{3}{521}\pi$ (B) $\frac{3\pi}{512}$

(C) $\frac{3\pi}{151}$ (D) 24

14 $\int_0^{\frac{\pi}{4}} \sin^4 4x \cdot \cos^3 2x \, dx =$ _____.

(A) $\frac{128}{1155}$ (B) $\frac{128}{1155}\pi$

(C) $\frac{128}{1155} \times \frac{\pi}{2}$ (D) $\frac{128}{1155\pi}$

15 $\int_0^{\frac{\pi}{3}} \sin^7\left(\frac{3x}{2}\right) dx =$ _____.

(A) $\frac{32}{105} \times \pi$ (B) $\frac{32}{105} \times \frac{\pi}{3}$

(C) $\frac{2\pi}{3}$ (D) $\frac{32}{105}$

16 $\frac{1}{n^2+1^2} + \frac{2}{n^2+2^2} + \frac{3}{n^2+3^2} + \ldots\ldots + \frac{n}{n^2+n^2} =$ _____.

(A) log 2 (B) 2 log 2

(C) $\frac{1}{2}$ log 2 (D) –log 2

17 The length of one arc of cycloid $x = 7(\theta - \sin\theta)$, $y = 7(1 - \cos\theta)$ is _____.

(A) 54 (B) 55

(C) 56 (D) 49

18 The total length of $x^2 + y^2 = 49$ is _____.

(A) 14 (B) 14π

(C) 49π (D) $49\pi^2$

19 Rotate the area between $y^2 = 4x,\ x^2 = 4y$ about X axis then the volume generated by this region is _____.

(A) $\frac{3\pi}{10}$ (B) $\frac{96\pi}{5}$

(C) $\frac{\pi}{5}$ (D) $\frac{5\pi}{96}$

20 Rotate the area between $y = e^x,\ y = 0,\ x = 1,\ x = 2$ about $x-$axis then the volume generated by this region is _____.

(A) $\frac{\pi}{4}e^2\left(e^2 - 1\right)$ (B) $\frac{\pi}{6}e^2\left(e^2 - 1\right)$

(C) $\frac{\pi}{2}e^2\left(e^2 - 1\right)$ (D) $\frac{\pi}{2}e^2\left(e^3 - 1\right)$

21 $|\bar{x} \times \bar{y}|^2 + (\bar{x} \cdot \bar{y})^2 =$ _____.

(A) $|\bar{x}|^2 + |\bar{y}|^2$ (B) $|\bar{x}|^2 |\bar{y}|^2$

(C) $|\bar{x}|^2$ (D) $|\bar{y}|^2$

22 If $\bar{F} = \left(xyz,\ xz^2,\ -y^3\right)$ then $\bar{F}_{xy}(1,2,3) =$ _____.

(A) (3,0,0) (B) (0,3,0)

(C) (0,0,3) (D) $3\hat{k}$

23 $[5\bar{x}\ \ 7\bar{x}\ \ \bar{y}] =$ _____.

(A) 5 (B) 7

(C) 35 (D) 0

24 $\nabla(fg) =$ _____.

(A) $fg + \nabla f \nabla g$ (B) $f\nabla g + g\nabla f$

(C) $f\nabla g - g\nabla f$ (D) None of above

25 $(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})=[\bar{a}\ \bar{b}\ \bar{d}]\bar{c}-$ _____ $\bar{d}$.

(A) $[\bar{a}\ \bar{b}\ \bar{c}]$ (B) $[\bar{a}\ \bar{d}\ \bar{b}]$

(C) $[\bar{b}\ \bar{b}\ \bar{a}]$ (D) $\bar{a}$

26 If $\bar{f}=x^2z\,\hat{i}+2y\,\hat{j}+y^3\,\hat{k}$ then *div* $\bar{f}=$ _____.

(A) $2x+z$ (B) $2xz+2$

(C) $x+2z$ (D) None of above

27 If $r=|\bar{r}|$ where $\bar{r}=(x,y,z)\in R^3$ then show that $\nabla\left(\frac{1}{r}\right)=$ _____.

(A) $\hat{r}$ (B) $-\frac{1}{r^2}$

(C) $-\frac{1}{r^3}\bar{r}$ (D) $r\bar{r}$

28 If $\bar{f}=\left(x^2y,\ y^2z,\ z^2x\right)$ then *curl* $\bar{f}=$ _____.

(A) $\left(-y^2,-z^2,x^2\right)$ (B) $\left(-y^2,-z^2,-x^2\right)$

(C) $\left(-y^2,z^2,-x^2\right)$ (D) $\left(y^2,-z^2,-x^2\right)$

29 Equation of tangent plane to the sphere $x^2+y^2+z^2=26$ at the point $(3,4,-1)$ is

(A) $3x+4y+z=26$ (B) $3x+4y-z+26=0$

(C) $3x+4y-z=26$ (D) None of above

30 The intersection of sphere and a plane is _____.

(A) circle (B) plane

(C) sphere (D) none of above

1 If two sphere touches externally than ____.

(A) $c_1c_2 = |r_1 - r_2|$ (B) $c_1c_2 = r_1r_2$

(C) $c_1c_2 = r_1 + r_2$ (D) none of above

2 The equation of cone having vertex (0,0,0), X axis as its axis and semi vertical angle θ is given by

(A) $y^2 + z^2 = x^2 \cos^2\theta$ (B) $y^2 + z^2 = x^2 \sin^2\theta$

(C) $y^2 + z^2 = x^2 \tan^2\theta$ (D) $y^2 + z^2 = x^2 \cot^2\theta$

33 The equation of cone having vertex at origin curve $x^2 + y^2 = 4,\ z = 2$ is ____.

(A) $x^2 + y^2 - z^2 = 0$ (B) $x^2 + y^2 + z^2 = 0$

(C) $x^2 + y^2 = 4$ (D) $x^2 + 4z^2 = 0$

34 If axis of the right circular cylinder of radius 2 is $\{(1,3,2k)/k \in R\}$ then the equation of the right circular cylinder is

(A) $(x-1)^2 + (y-3)^2 = 2^2$ (B) $(x-1)^2 + (y-3)^2 = 0$

(C) $(x+1)^2 + (y+3)^2 = 2^2$ (D) none of these

35 Redius and centre of the sphere $x^2 + y^2 + z^2 = 49$ is

(A) 49, (0,0,0) (B) 7, (1,−1,1)

(C) 7, (0,0,0) (D) 7, (7,0,0)