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B.Sc.Sem. I Examination (New Course)
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Set Theory & Function

કુલ સમય :– ૬૦ મીનીટ કુલ પ્રશ્નો : ૫૦ વિદ્યાર્થીએ ટીક કરવાના પ્રશ્નો : ૩૫

નોંધ : વિદ્યાર્થીએ માત્ર ૩૫ પ્રશ્નો જ ટીક કરવાના રહેશે. જો વધારે ટીક કરેલ હશે તો પ્રથમ ૩૫ પ્રશ્નો જ ગણતરીમાં લેવામાં આવશે.

1) $For\ Cauchy\ Mean\ Value\ theorem, functions\ f(x) = \sin x\ , g(x) = \cos x\ ; x \in \left[0, \frac{\pi}{2}\right]$ $then\ c =$ _____.

$(a)\ \pi \qquad (b)\frac{\pi}{4}(c)\ 2\pi \qquad (d)0$

2) $Real\ function\ f(x) and\ g(x) are\ differentiable\ on$ _____.

$(a)[a,b](b)(a,b)(c)\ [a,b) \qquad (d)(a,b]$

3) $-x^2 - \frac{x^4}{2} - \frac{x^6}{3} -$ ……. = _____.

$(a)\log(1-x^2)\ (b)\log x\ (c)\sin x\ (d)\cos x$

4) $1 - \frac{\left(x-\frac{\pi}{2}\right)^2}{2!} + \frac{\left(x-\frac{\pi}{4}\right)^4}{4!} -$ …… = _____.

$(a)\log(1-x^2)\ (b)\log x\ (c)\sin x\ (d)\cos x$

5) $-\frac{1}{n}\sin^{n-1} x\cos x + \frac{n-1}{n}\int sin^{n-2} x\ dx =$ _____.

$(a)\int sin^n x\ dx \qquad (b)\int sin^2 x\ dx \qquad (c)\int cos^n x\ dx \qquad (d)\int cos^2 x\ dx$

6) $\int_0^{\pi/2} sin^8 x\ dx =$ _____.

$(a)\frac{32}{105}(b)\ 0 \qquad (c)\frac{256\pi}{35} \qquad (d)\frac{35\pi}{256}$

7) $\int_0^{\frac{\pi}{2}} sin^{10} x\ cos^4 x\ dx =$ _____.

$(a)\frac{9}{4096}(b)\frac{9\pi}{4096}(c)\frac{4096}{9} \qquad (d)10$

8) $\int_0^2 x^3(4-x^2)^{5/2}\ dx =$ _____.

$(a)\frac{63}{1024}(b)\ 0 \qquad (c)\frac{1024}{63}(d)\ \pi$

9) $\frac{n}{n^2+1^2} + \frac{n}{n^2+2^2} + \frac{n}{n^2+3^2} +$ …… $+\frac{1}{n^2+n^2} +$ …… = _____.

$(a)\frac{\pi}{4}(b)\frac{\pi}{2}(c)\ 1 \qquad (d)\ 0$

10) $Find\ the\ length\ of\ arc\ of\ asteroid\ x^{2/3} + y^{2/3} = a^{2/3}.$

$(a)\ 6a \qquad (b)\ 4a \qquad (c)\ 2a \qquad (d)a$

11) $Find\ the\ volume\ of\ the\ paraboloid\ generated\ by\ revolving\ the\ area\ bounded\ by\ parabola\ y^2 = 4ax\ and\ straight\ line\ x = 4a\ about\ X-axis.$

$(a)\ 5\pi^2(b)\ 32\pi a^3(c)\frac{5\pi}{3}(d)2\ \pi$

12) $If\ \bar{x} = (1,2,-1)\ and\ \bar{y} = (1,2,2)\ then\ \bar{x}\cdot\bar{y} =$ _____.

$(a)\ 1 \qquad (b)\ 2 \qquad (c)\ 3 \qquad (d)4$

13) $If\ \bar{x} = (2020,2021,2022)\ then\ \bar{x}\times\bar{x} =$ _____.

$(a)\bar{0}(b)\bar{1}(c)\bar{6} \qquad (d)\bar{5}$

14) $[\bar{z}\bar{x}\bar{y}]$ =_____.

$(a)\bar{0}(b)[\bar{x}\bar{y}\bar{z}](c)\overline{xyz} \qquad (d)\bar{1}$

15) $If\ \bar{x} = (10,20,30)\ and\ \bar{y} = (2,4,6)\ then\ \bar{x}\cdot(\bar{x}\times\bar{y}) =$ _____

$(a)\ 30 \qquad (b)\ 1 \qquad (c)\ 0 \qquad (d)20$

16) $[\bar{a}\bar{b}\bar{c}] = 0$ *if and only if* $\bar{a}\bar{b}\bar{c}$ *are* _____.

$(a)co-ordinates$ $(b)\ coplanar$ $(c)\ constant$ $(d)\pi$

17) *If* $\bar{a}, \bar{b}, \bar{c} \in R^3$ then $\bar{a} \times (\bar{b} \times \bar{c})$ = _____.

$(a)[\bar{a}\bar{b}\bar{c}](b)0(c)\ 2[\bar{a}\bar{b}\bar{c}](d)(\bar{a}\cdot\bar{c})\bar{b} - (\bar{a}\cdot\bar{b})\bar{c}$

18) $\bar{a} \times (\bar{b} \times \bar{c}) + \bar{b} \times (\bar{c} \times \bar{a}) + \bar{c} \times (\bar{a} \times \bar{b}) =$ _____.

$(a)\bar{0}(b)[\bar{a}\bar{b}\bar{c}](c)\bar{a} \times \bar{b}$ $(d)\bar{c} \times \bar{a}$

19) *Find the polar co-ordinates of the point having cartesian co-ordinates* $(1, -\sqrt{3})$ *in* R^2.

$(a)(2, \frac{\pi}{2})$ $(b)\ (\sqrt{2}, \frac{\pi}{2})$ $(c)\ (2, -\frac{\pi}{3})$ $(d)(\sqrt{2}, \frac{\pi}{4})$

20) $(\bar{a} - \bar{b}) \times (\bar{a} + \bar{b}) =$ _____.

$(a)|\bar{a} \times \bar{b}|^2 (b)(\bar{a}\cdot\bar{b})^2 (c)2(\bar{a} \times \bar{b})$ $(d)0$

21) $(\frac{\partial\emptyset}{\partial x}, \frac{\partial\emptyset}{\partial y}, \frac{\partial\emptyset}{\partial z}) =$ _____. *where* $\emptyset$ *is a scalar function*

$(a)\ 0$ $(b)\frac{\pi}{2}(c)\text{curl}\ \emptyset(d)grad\ \emptyset$

22) $Curl\ F =$ _____. *where F is a vector function.*

$(a)\nabla F$ $(b)\nabla \times F$ $(c)\nabla^2 (d)\ 0$

23) $(grad\ \emptyset)F + \emptyset(div\ F) =$ _____. *where* $\emptyset$ *is a scalar function & F is vector functions.*

$(a)grad\ (F \times G)(b)\ Curl(F \times G)(c)\text{div}(\emptyset\text{F})(d)\ 0$

24) $Curl\ (grad\ \emptyset) =$ _____. *where* $\emptyset$ *is a scalar function*

$(a)\ 0$ $(b)1(c)\nabla\emptyset(d)curl\emptyset$

25) *If* $\bar{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}\ \&\ r = |\bar{r}|$ *then* $f''(r) + \frac{2}{r}f'(r) =$ _____.

$(a)\bar{r}(b)\nabla^2 f(r)(c)\frac{\bar{r}}{r}(d)0$

26) *If* $\emptyset(x, y, z) = x^2yz^3 + xy^2z^2$ *then find grad* $\emptyset$ *at point* (1,3,2).

$(a)\ (84,32,72)$ $(b)\ (82,32,72)$ $(c)\ (7,3,-8)$ $(d)(7,-3,8)$

27) *Find the radius of the circle* $x^2 + y^2 + z^2 - 2y + 2z - 23 =, x + 2y - 2z + 5 = 0.$

$(a)\ 0$ $(b)\ 1$ $(c)\ 3$ $(d)\ 5$

28) Ifthe angle of intersection of two sphere is _____ then the spheres are called orthogonal sphere.

$(a)\ 0$ $(b)\ \pi$ $(c)\frac{\pi}{2}(d)2\pi$

29) *The intersection of sphere and a plane is* _____.

$(a)\ sphere$ $(b)\text{circle}\ (c)curve$ $(d)cylinder$

30) *If the plane* $kx - y - 2z = 4$ *touches the sphere* $x^2 + y^2 + z^2 + 2x - 6y + 1 = 0$ *then find the value of* k.

$(a) -\frac{1}{4}(b)\frac{1}{4}(c)\ 4(d) - 4$

31) *If* $y = \sin(ax + b)\,; a \neq 0, b \in R$ *then* $y_n =$ _____.

$(a)a^n \sin\left(ax + b + \frac{\pi}{2}\right)(b)a^n \sin\left(ax + b + \frac{n\pi}{2}\right)$

$(c)a^n \sin\left(ax + b + \frac{\pi}{4}\right)(d)a^n \sin\left(ax + b + \frac{\pi}{2}\right)$

32) Write name of the following statement?

If u and v are functions of x & there n^{th} *derivatives exist then*

$(uv)_n = \binom{n}{0}u_n v + \binom{n}{1}u_{n-1}v_1 + \ \ldots\ldots\ldots\ldots + \binom{n}{r}u_{n-r}v_r + \ \ldots\ldots\ldots + \binom{n}{n}uv_n$

$(a)Maclaurin's\ theorem$ $(b)\text{Leibnitz's theorem}$ $(c)Euler\ theorem$ $(d)Taylor's theorem$

33) Write name of the following statement?

For real function $f(x)$,

$(i)f^{(n-1)}(x)$ *is continuous on* $[0, x]\&(ii)f^{(n-1)}(x)$ *is differentiable on* $(0, x)$ *then*

$$f(x) = f(0) + xf'(0) + \frac{x^2}{2!}f''(0) + \ \ldots\ldots\ldots + \frac{x^{n-1}}{(n-1)!}f^{n-1}(0) + R_n$$

$(a) Maclaurin's\ theorem \quad (b)$Leibnitz's theorem $\quad (c) Euler\ theorem \quad (d) Taylor's theorem$

34) $If\ y = \sin(3x+4)\ then\ y_5(0) =$ _____.

$(a)\ 0 \qquad (b) - 3^5 \cos 4 \ (c) 3^5 \cos 4 \ (d)\ None$

35) $\frac{1}{\sqrt{n^2}} + \frac{1}{\sqrt{n^2-1^2}} + \frac{1}{\sqrt{n^2-2^2}} + \ \ldots\ldots\ldots\ldots = $ _____

$(a)\ 3\pi \ (b) 2\pi \qquad (c)\frac{\pi}{2} \ (d)\ 4\pi$

36) $n!\, x^n \sum_{r=0}^{r=n} \{\binom{n}{r}\}^2 =$ _____.

$(a)(x^{2n})_1 (b)(x^{2n})_n (c)(x^n)_1 (d)(x^{2n})_{2n}$

37) $If\ y = (2x+1)^5\ then\ y_5 =$ _____.

$(a) 5!\, 2^2 (b) 5!\, 2^5 (c) 5!\, 2^{25} (d)\ 0$

38) $Find\ the\ length\ of\ arc\ of\ \ the\ circle\ 6y^2 = (2x+8)^3.$

$(a)\frac{2}{9}[125 + 13\sqrt{13}] \quad (b) 125 - 13\sqrt{13} (c) \log(\sqrt{2}+1)\ (d)\frac{2}{9}[125 - 13\sqrt{13}]$

39) $If\ the\ sets\ \{\overline{a_1}, \overline{a_2}, \overline{a_3}\}\ and\ \{\overline{b_1}, \overline{b_2}, \overline{b_3}\}\ are\ reciprocal\ sets\ of\ vector\ then\ \overline{a_1} \cdot \overline{b_2}$=_____ and$\overline{a_3} \cdot \overline{b_3}$ =_____.

$(a)\ 0{,}1 \qquad (b) 1{,}1 \qquad (c)\ 1{,}0\ (d)\ 0{,}0$

40) $If\ the\ sets\ \{\overline{a_1}, \overline{a_2}, \overline{a_3}\}\ and\ \{\overline{b_1}, \overline{b_2}, \overline{b_3}\}\ are\ reciprocal\ sets\ of\ vector\ then$ $[\overline{a_1 a_2 a_3}][\overline{b_1 b_2 b_3}]$=_____

$(a)\ 0 \qquad (b)\ 1 \qquad (c)\ 3 \qquad (d)\ 5$

41) $If\ F(x,y,z) = x^2\hat{\imath} + y^2\hat{\jmath} + z^2\hat{k}\ then\ Curl\ F$=_____.

$(a)\ 0 \qquad (b)\ 1 \qquad (c)\ 2 \qquad (d)\ 3$

42) $The\ radius\ and\ centers\ of\ two\ spheres\ are\ r_1, r_2\ and\ c_1, c_2\ respectively.\ Give\ the\ condition\ that\ two\ sphere\ touches\ internally.$

$(a) c_1c_2 < r_1 - r_2 (b) c_1c_2 \neq |r_1 + r_2| (c) c_1c_2 \leq r_1 + r_2 (d) c_1c_2 = |r_1 - r_2|$

43) Polar co-ordinates are _____.

$(a)(x,y)(b)(r,\theta)(c)\frac{\pi}{2}(d)\ \pi$

44) The equation of cone having vertices at origin curve $x^2 + y^2 = 4\ , z = 2$ is _____.

$(a) x^2 + y^2 = z^2 (b) x^2 + y^2 = 8 \qquad (c) x^2 + z^2 = 0 \qquad (d) x^2 + y^2 = 1$

45) General equation of sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$, radius =_____.

$(a)\sqrt{u^2+v^2+w^2} (b)\sqrt{2u^2+2v^2+2w^2} (c)\sqrt{u^2+v^2+w^2-d} (d)\ None$

46) Find the volume of sphere of radius 'a'.

$(a)\ 4\pi a^3 (b)\frac{4}{3}\pi a^3 (c)\frac{4\pi}{2}(d)\ \pi$

47) $If\ \bar{a}\ is\ constant\ vector\ then\ div\ (\bar{a} \times \bar{r})$=_____.

$(a)\ 0 \qquad (b)\bar{a} (c)\frac{\pi}{2}(d)\ None$

48) $(\bar{a} \times \bar{b}) \times (\bar{c} \times \bar{d})$=_____.

$(a)[\bar{a}\bar{b}\bar{d}]\bar{c} - [\bar{a}\bar{b}\bar{c}]\bar{d} (b)[\bar{a}\bar{b}\bar{d}]\bar{c} + [\bar{a}\bar{b}\bar{c}]\bar{d} (c)[\bar{a}\bar{b}\bar{c}] (d)\ None$

49) $If\ y = sin^3 x\ then\ y_{100}(0)$=_____.

$(a) \cos x \ (b)\ 100 \qquad (c)\ 0\ (d)\ None$

50) $\int sin^m x\, cos^n x\, dx =$ _____ $\sin^{m-1} x\, cos^{n+1} x + \frac{m-1}{m+n}\int sin^{m-2} x\, cos^n x\, dx$

$(a)\frac{1}{m+n} (b) -\frac{1}{m+n} (c)\frac{n}{m-n} (d)\ None$