V.P.and R.P.T.P. Science College , Vidyanagar .
Mathematics Department.
Fill in the following blanks.
Multiple Choice Question Of US03CMTH22
(MULTIVARIATE CALCULUS)
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UNIT-1

Fill in the following blanks.

(1) The value of $\int_{-\infty}^{0} \frac{1}{\sqrt{3-x}}\, dx$ is ....
(a) 0 **(b)** ∞ (c) 3 (d) 1

(2) The value of $\int_{0}^{\infty} \frac{1}{x^2}\, dx$ is ....
(a) 0 (b) 1 **(c)** ∞ (d) 2

(3) The value of $\int_{0}^{\infty} (1+2x)e^{-x}\, dx$ is ....
(a) 0 (b) 1 **(c)** 3 (d) ∞

(4) The value of $\int_{-5}^{1} \frac{1}{10+2x}\, dx$ is ....
(a) 0 (b) 1 (c) ∞ **(d)** 2

(5) The value of $\int_{-\infty}^{1} \sqrt{6-x}\, dx$ is ....
(a) 0 (b) 1 (c) 2 **(d)** ∞

(6) The value of $\int_{2}^{\infty} \frac{9}{(1-3x)^4}\, dx$ is ....
(a) 0 (b) 3/125 **(c)** 1/125 (d) ∞

(7) The value of $\int_{-\infty}^{\infty} \frac{6x^3}{(x^4+1)^2}\, dx$ is ....
(a) 0 (b) 1 (c) 6 (d) ∞

(8) The value of $\int_{1}^{\infty} \frac{1}{x^2+x-6}\, dx$ is ....
(a) 0 (b) 1 (c) 6 **(d)** ∞

(9) The value of $\int_{-\infty}^{0} \frac{e^{1/x}}{x^2}\, dx$ is ....
(a) 0 **(b)** 1 (c) 2 ∞

(10) The value of $\int_{1}^{\pi} \sec^2 x\, dx$ is ....
(a) 0 (b) 1 (c) π **(d)** ∞

(11) The value of $\int_{0}^{\infty} \frac{1}{x^2+4}\, dx$ is ....
(a) 0 (b) 1 (c) $\pi/2$ **(d)** $\pi/4$

(12) The value of $\int_0^3 \frac{1}{\sqrt{9-x^2}}\, dx$ is ....
(a) 0 (b) 1 **(c)** $\pi/2$ (d) ∞

(13) The value of $\int_0^\infty x^2 e^{-x}\, dx$ is ....
(a) 0 **(b)** 2 (c) -2 (d) ∞

(14) The value of $\int_{-\infty}^0 2^{5x}\, dx$ is ....
(a) 0 **(b)** $1/5log2$ (c) $1/log2$ (d) $2/5log2$

(15) The value of $\int_{-\infty}^\infty \frac{1}{4x^2+25}\, dx$ is ....
(a) $\pi/10$ (b) $\pi/5$ (c) $\pi/2$ (d) π

(16) The value of $\int_1^\infty \frac{1}{x^2}\, dx$ is ....
(a) 1 (b) 0 (c) -1 (d) does not exist

(17) The value of $\int_0^\infty \frac{1}{1+x^2}\, dx$ is ....
(a) π **(b)** $\pi/2$ (c) 0 (d) 1

(18) The value of $\int_0^\infty e^{-x}\cos 2x\, dx$ is ....
(a) 0 (b) $-1/5$ **(c)** $1/5$ (d) $2/5$

(19) The value of $\int_0^\infty e^{-y^3}\sqrt{y}\, dy$ is ....
(a) $\sqrt{\pi}/2$ **(b)** $\sqrt{\pi}/3$ (c) $\sqrt{\pi}$ (d) $\sqrt{\pi}/6$

(20) The value of $B(m+1,n)$ is ....
(a) $\frac{n}{m+n}B(m,n)$ (b) $\frac{n}{m+1}B(m,n)$ **(c)** $\frac{m}{m+n}B(m,n)$ (d) $\frac{m}{m+1}B(m,n)$

(21) The value of $\int_0^{\pi/2} \sqrt{\cot\theta}\, d\theta$ is ....
(a) $\sqrt{2}\pi/2$ (b) $\pi/2$ (c) $\sqrt{2}\pi/4$ (d) $\pi/4$

(22) The value of $\int_0^1 x^4 \left[\log\frac{1}{3}\right]^3 dx$ is ....
(a) $3/325$ **(b)** $6/625$ (c) $3/625$ (d) $6/325$

(23) If $B(n,2) = \frac{1}{6}$ and n is positive integer , then the value of n is ....
(a) 3 (b) -2 **(c)** 2 (d) -3

(24) The value of $\int_0^\infty \frac{t^2\, dt}{1+t^4}$ is ....
(a) $\pi/\sqrt{2}$ (b) $\sqrt{2}\pi/2$ (c) $\pi/2$ (d) $\pi/4$

(25) Gamma function is decontinuous for ....
(a) all $p<0$ (b) any $p>0$ (c) $p=0$ only **(d)** $p=0$ and negative integers

(26) Beta function $B(p,q)$ is convergent for ....
(a) $p>0$, $q<0$ **(b)** $p>0$, $q>0$ (c) $p<0$, $q>0$ (d) $p<0$, $q<0$

(27) Angle between the vector $2\mathbf{i}+2\mathbf{j}-\mathbf{k}$ and $6\mathbf{i}-3\mathbf{j}+2\mathbf{k}$ is ....
(a) $\cos^{-1}\left[\frac{4}{11}\right]$ (b) $\cos^{-1}\left[\frac{4}{7}\right]$ (c) $\sin^{-1}\left[\frac{4}{11}\right]$ **(d)** $\cos^{-1}\left[\frac{4}{21}\right]$

(28) The magnitude of acceleration vector at $t=0$ on the curve $x=2\cos t$, $y=2\sin 3t$, $z=3t$ is ....
(a) 6 (b) 9 **(c)** 18 (d) 3

(29) The magnitude of the normal vector to the surface $x^2+2y^2+z^2=7$ at the point $(1,-1,2)$ is ....
(a) 2/3 (b) 3/2 (c) 3 **(d)** 6

(30) A unit normal vector to the surface $z=2xy$ at the point $(2,1,4)$ is ....
(a) $2\mathbf{i}+4\mathbf{j}-\mathbf{k}$ (b) $2\mathbf{i}+4\mathbf{j}+\mathbf{k}$ **(c)** $\frac{1}{\sqrt{21}}(2\mathbf{i}+4\mathbf{j}-\mathbf{k})$ (d) $\frac{1}{\sqrt{21}}(2\mathbf{i}+4\mathbf{j}+\mathbf{k})$

(31) If $\phi=xyz$ then the value of $|\operatorname{grad}\phi|$ at the point $(1,2,-1)$ is ....
(a) 0 (b) 1 (c) 2 **(d)** 3

(32) The maximum rate of change of $\phi=xy^2+yz+zx^2$ at the point $(1,1,1)$ is ....
(a) $\sqrt{11}$ (b) 0 (c) 3 **(d)** none of these

(33) The maximum value of the direction derivative of $f=x^2-2y^2+4z^2$ at the point $(1,1,-1)$ is ....
(a) $\sqrt{7}/3$ (b) 84 **(c)** $2\sqrt{21}$ (d) none of these

(34) If the direction derivative of $f(x,y,z)=ax+by+cz$ at the point $(1,1,1)$ has maximum magnitude 4 in the direction parallel to x - axis , then the values of a,b,c are .... respectively .
(a) $-2,-2,2$ **(b)** $2,-2,2$ (c) $2,-2,-2$ (d) $-2,2,2$

(35) If $\mathbf{r}=x\mathbf{i}+y\mathbf{j}+z\mathbf{k}$ and $\mathbf{a}=\mathbf{r}/3$ then $div\ \mathbf{a}=$ ....
(a) 0 **(b)** 1 (c) -1 (d) 2

(36) If $\bar{F}=(2x+y)\mathbf{i}+(3x-2z)\mathbf{j}+(x+mz)\mathbf{k}$ is solenoidal then m is ....
(a) -2 (b) 2 (c) 0 (d) 1

(37) If $(x+2y)\mathbf{i}+(2x-3y)\mathbf{j}+(x+az)\mathbf{k}$ is solenoidal then a is ....
(a) -2 **(b)** 2 (c) 0 (d) 3

(38) If $\mathbf{V}=3xyz\mathbf{i}-2x^2y\mathbf{j}+2z\mathbf{k}$ then $|div\ \mathbf{V}|$ at $(1,1,1)$ is ....
(a) 0 (b) 2 (c) 1 **(d)** 3

(39) If $\mathbf{r}=x\mathbf{i}+y\mathbf{j}+z\mathbf{k}$ then $curl\ \mathbf{r}$ is ....
(a) $\mathbf{r}$ (b) $-\mathbf{r}$ (c) 0 **(d)** $\mathbf{0}$

(40) If $\mathbf{V}=(2+y)\mathbf{i}+ax\mathbf{j}+2z\mathbf{k}$ is irrotational then a is ....
(a) 1 (b) 2 (c) 3 (d) -1

(41) The vector defined by $\mathbf{F}=e^x\sin y\ \mathbf{i}+e^x\cos y\ \mathbf{j}$ is ....
(a) rotational **(b)** irrotational (c) solenoidal (d) none of these

(42) If $\phi=\tan^{-1}(y/x)$ then $div(grad\ \phi)=$ ....
(a) 1 (b) 2 **(c)** 0 (d) -1

(43) If $\phi=2x^2-3y^2+4z^2$ then $curl(grad\ \phi)=$ ....
(a) $4x-6y+8z$ (b) $4x\mathbf{i}-6y\mathbf{j}+8z\mathbf{k}$ **(c)** $\mathbf{0}$ (d) 0

UNIT-2

(1) $\dfrac{ds}{dt}$ = ...

(a) $\left|\dfrac{d\bar{r}}{dt}\right|$ (b) $\dfrac{d\bar{r}}{dt}$ (c) $\left|\dfrac{d\bar{r}}{ds}\right|$ (d) $\left|\dfrac{dr}{dt}\right|$

(2) For the curve $x^2 + y^2 = 1$, $\dfrac{ds}{dt}$ = ...

(a) 0 **(b)** 1 (c) $\sqrt{2}$ (d) -1

(3) For the curve $y = x$, $\dfrac{ds}{dt}$ = ...

(a) 2 (b) 1 **(c)** $\sqrt{2}$ (d) $-\sqrt{2}$

(4) For the curve $y = -x$, $\dfrac{ds}{dt}$ = ...

(a) 2 (b) 1 **(c)** $\sqrt{2}$ (d) $-\sqrt{2}$

(5) For $x + y = u$, $x - y = v$, jacobian J = ...

(a) -2 (b) 2 (c) $\dfrac{1}{2}$ **(d)** $\dfrac{-1}{2}$

(6) For $x + y = u$, $x - 2y = v$, jacobian $|J|$ = ...

(a) $\dfrac{1}{3}$ (b) $\dfrac{-1}{3}$ (c) $\dfrac{1}{2}$ (d) $\dfrac{-1}{2}$

(7) In double integral , Area of region R is given by A = ...

(a) $\iint\limits_R dxdy$ (b) $\iint\limits_C dxdy$ (c) $\iint\limits_R f(x,y)\,dxdy$ (d) $\iint\limits_R dxdydz$

(8) In double integral , Volume of f(x,y) over region R is given by V = ...

(a) $\iint\limits_R dxdy$ (b) $\iint\limits_C f(x,y)\,dxdy$ **(c)** $\iint\limits_R f(x,y)\,dxdy$ (d) $\iint\limits_R dxdydz$

(9) If we change Cartesian variable (x,y) to Cartesian variable (u,v) in double integral then dxdy = ...

(a) dudv (b) J dudv **(c)** $|J|\,dudv$ (d) $|J|\,dxdy$

(10) If we change Cartesian variable (x,y) to Polar variable (r, θ) in double integral then dxdy = ...

(a) $drd\theta$ **(b)** $rdrd\theta$ (c) $|J|\,dxdy$ (d) $r^2drd\theta$

(11) Work done by force $\bar{p}$ over the curve C is given by W = ...

(a) $\int\limits_C \bar{p}\cdot d\bar{r}$ (b) $\int\limits_C \bar{p}\,d\bar{r}$ (c) $\int\limits_C \bar{p}\,dxdy$ (d) $\iint\limits_C \bar{p}\cdot d\bar{r}$

(12) If region R is represented by $a \le x \le b$; $f_1(x) \le y \le f_2(x)$ then $\iint\limits_R f(x,y)\ dxdy$ = ...

(a) $\int\limits_a^b \int\limits_{f_1(x)}^{f_2(x)} f(x,y)\,dydx$ (b) $\int\limits_a^b \int\limits_c^d f(x,y)\,dxdy$ (c) $\int\limits_{f_1(x)}^{f_2(x)} \int\limits_a^b f(x,y)\,dxdy$ (d) $\int\limits_a^b \int\limits_{f_1(x)}^{f_2(x)} dydx$

(13) If region R is represented by $a \le y \le b$; $f_1(y) \le x \le f_2(y)$ then $\iint\limits_R f(x,y)\ dxdy$ = ...

(a) $\int\limits_a^b \int\limits_c^d f(x,y)\,dxdy$ (b) $\int\limits_{f_1(y)}^{f_2(y)} \int\limits_a^b f(x,y)\,dydx$ (c) $\int\limits_a^b \int\limits_{f_1(y)}^{f_2(y)} dxdy$ **(d)** $\int\limits_a^b \int\limits_{f_1(y)}^{f_2(y)} f(x,y)\,dxdy$

(14) $\int\limits_0^1 \int\limits_0^2 dxdy$ = ...

(a) 1 (b) 0 (c) 3 **(d)** 2

(15) $\int_0^1 \int_0^2 y\, dxdy =$ ....

(a) 1 (b) 0 (c) 3 (d) 2

(16) $\int_0^1 \int_0^x dydx =$ ....

(a) 1 **(b)** 1/2 (c) x (d) 2

(17) $\int_0^2 \int_0^x dydx =$ ....

(a) 1 (b) 1/2 (c) x **(d)** 2

(18) $\int_0^2 \int_0^y dxdy =$ ....

(a) 1 (b) 1/2 (c) 0 **(d)** 2

(19) If $x = r\cos\theta$; $y = r\sin\theta$ then Jacobian J = ...

(a) 1 (b) r^2 **(c)** r (d) 2

(20) In double integral , Total mass of density f(x,y) over region R is given by M = ...

(a) $\iint_R dxdy$ (b) $\iint_C f(x,y)\, dxdy$ **(c)** $\iint_R f(x,y)\, dxdy$ (d) $\iint_R dxdydz$

(21) In double integral , Total mass M of density 1 over region $0 \le x, y \le 2$ is ....

(a) 1 (b) 2 (c) 0 **(d)** 4

(22) In double integral , Total mass M of density 1 over region $0 \le x \le 2$; $0 \le y \le 1$ is ....

(a) 1 **(b)** 2 (c) 0 (d) 4

(23) In double integral , co-ordinate $\bar{x}$ of center of gravity of density f(x,y) over region R is given by $\bar{x} =$ ....

(a) $\frac{1}{M}\iint_R dxdy$ (b) $\iint_R xf(x,y)\, dxdy$ (c) $\frac{1}{M}\iint_R yf(x,y)\, dxdy$ **(d)** $\frac{1}{M}\iint_R xf(x,y)\, dxdy$

(24) In double integral , co-ordinate $\bar{y}$ of center of gravity of density f(x,y) over region R is given by $\bar{y} =$ ....

(a) $\frac{1}{M}\iint_R dxdy$ (b) $\iint_R yf(x,y)\, dxdy$ **(c)** $\frac{1}{M}\iint_R yf(x,y)\, dxdy$ (d) $\frac{1}{M}\iint_R xf(x,y)\, dxdy$

(25) In double integral , moment of inertia I_x of density f(x,y) over region R is given by $I_x =$ ....

(a) $\iint_R xf(x,y)\, dxdy$ **(b)** $\iint_R y^2 f(x,y)\, dxdy$ (c) $\iint_R yf(x,y)\, dxdy$ (d) $\iint_R x^2 f(x,y)\, dxdy$

(26) In double integral , moment of inertia I_y of density f(x,y) over region R is given by $I_y =$ ....

(a) $\iint_R xf(x,y)\, dxdy$ (b) $\iint_R y^2 f(x,y)\, dxdy$ (c) $\iint_R yf(x,y)\, dxdy$ **(d)** $\iint_R x^2 f(x,y)\, dxdy$

(27) In double integral , moment of inertia I_0 of density f(x,y) over region R is given by $I_0 =$ ....

(a) $\iint\limits_R (x^2+y^2)f(x,y)\,dxdy$ (b) $\iint\limits_R y^2 f(x,y)\,dxdy$ (c) $\frac{1}{2}\iint\limits_R (x^2+y^2)f(x,y)\,dxdy$
(d) $\iint\limits_R x^2 f(x,y)\,dxdy$

UNIT-3

(1) $\int\limits_C [fdx+gdy+hdz]$ is independent of path iff $fdx+gdy+hdz$ is ....

(a) 0 (b) not exact (c) 1 **(d)** exact

(2) $\int\limits_C [fdx+gdy+hdz]$ is independent of path iff $fdx+gdy+hdz$ is ....

(a) 0 (b) not exact **(c)** du , for some u(x,y,z) (d) 1

(3) $\int\limits_C [fdx+gdy+hdz]$ is independent of path iff $curl\ \bar{v} =$ ...., where $\bar{v} = f\bar{i}+g\bar{j}+h\bar{k}$.

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

(4) $xdx+ydy+zdz =$ ....
(a) $d\left[\frac{x^2+y^2+z^2}{2}\right]$ (b) $d\left[\frac{x^2+y^2+z^2}{3}\right]$ (c) $d\left[x^2+y^2+z^2\right]$ (d) $d\left[\frac{(x+y+z)^2}{2}\right]$

(5) $yzdx+xzdy+xydz =$ ....
(a) $d\left[\frac{x^2+y^2+z^2}{2}\right]$ **(b)** $d[xyz]$ (c) $d\left[x^2+y^2+z^2\right]$ (d) $d\left[\frac{xyz}{2}\right]$

(6) In Green's theorem $\iint\limits_R \left[\frac{\partial g}{\partial x}-\frac{\partial f}{\partial y}\right] dxdy =$ ....

(a) $\int\limits_C [f\ dx+g\ dy]$ (b)$\int\limits_C [f\ dx-g\ dy]$ (c)$\int\limits_C [g\ dx+f\ dy]$ (d)$\int\limits_C [g\ dx-f\ dy]$

(7) Area of plane region in Cartesian form is given by A = ...

(a) $\frac{1}{2}\int\limits_C [x\ dx+y\ dy]$ **(b)** $\frac{1}{2}\int\limits_C [x\ dy-y\ dx]$ (c) $\frac{1}{2}\int\limits_C [x\ dy+y\ dx]$ (d) $\frac{1}{2}\int\limits_C [x\ dx-y\ dy]$

(8) Area of plane region in Polar form is given by A = ...

(a) $\frac{1}{2}\int\limits_C r^2 d\theta$ (b) $\int\limits_C r^2 d\theta$ (c) $\frac{1}{2}\int\limits_C r\ d\theta$ (d) $\frac{1}{2}\int\limits_C [x\ dx-y\ dy]$

(9) Area of plane region $r = a(1+\cos\theta)$ is A = ...

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

(10) Area of limacon $r = a(1+\cos\theta)$ in the first and second quadrant is A = ...

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

(11) If $f = y^3$, $g = x^3+3y^2x$ then $\frac{\partial g}{\partial x}-\frac{\partial f}{\partial y} =$ ....
(a) $3y^2$ (b) $3x^2+3y^2$ (c) $3x$ **(d)** $3x^2$

(12) If $f = y^3$, $g = x^3 + 3y^2x$ then $\dfrac{\partial f}{\partial y} - \dfrac{\partial g}{\partial x} =$ ....

(a) $-3x^2$ (b) $3x^2 + 3y^2$ (c) $3y^2$ (d) $3x^2$

(13) If $f = -xy^2$, $g = x^2y$ then $\dfrac{\partial f}{\partial y} - \dfrac{\partial g}{\partial x} =$ ....

(a) $4xy$ **(b)** $-4xy$ (c) $2xy$ (d) $-2xy$

(14) If $f = -xy^2$, $g = x^2y$ then $\dfrac{\partial g}{\partial x} - \dfrac{\partial f}{\partial y} =$ ....

(a) $2xy$ (b) $-4xy$ **(c)** $4xy$ (d) $-2xy$

(15) In usual notation we say that, $\iint\limits_R \nabla^2 w \, dxdy =$ ....

(a) $\int\limits_C \dfrac{\partial^2 w}{\partial n^2} \, ds$ **(b)** $\int\limits_C \dfrac{\partial w}{\partial n} \, ds$ (c) $\dfrac{1}{2}\int\limits_C \dfrac{\partial w}{\partial n} \, ds$ (d) $\int\limits_C \dfrac{dw}{dn} \, ds$

(16) If $w = 2x^2 + y^2$ then $\nabla^2 w =$ ....

(a) $4x + 2y$ (b) $4x$ (c) 2 **(d)** 6

(17) If $w = 2x^2 - y^2$ then $\nabla^2 w =$ ....

(a) $4x + 2y$ (b) $4x$ **(c)** 2 (d) 6

(18) Vector form of Green's theorem is $\iint\limits_R \nabla \cdot \overline{v} \;\; dxdy =$ ....

(a) $\int\limits_C \overline{v} \cdot \overline{u} \;\; ds$ (b) $\int\limits_C \overline{v} \cdot \overline{n} \;\; dx$ **(c)** $\int\limits_C \overline{v} \cdot \overline{n} \;\; ds$ (d) $\int\limits_C \overline{v} \times \overline{n} \;\; ds$

(19) Vector form of Green's theorem is $\iint\limits_R (\nabla \times \overline{v}) \cdot \overline{k} \;\; dxdy =$ ....

(a) $\int\limits_C \overline{v} \cdot \overline{u} \;\; ds$ (b) $\int\limits_C \overline{v} \cdot \overline{u} \;\; dx$ (c) $\int\limits_C \overline{v} \cdot \overline{n} \;\; ds$ (d) $\int\limits_C \overline{v} \times \overline{n} \;\; ds$

(20) If $\bar{v} = 7x\bar{i} - 3y\bar{j}$ then $\iint\limits_R (\nabla \times \overline{v}) \cdot \overline{k} \;\; dxdy =$ ....

(a) 1 (b) 2 (c) -1 **(d)** 0

(21) If $\bar{v} = y\bar{i} + 4x\bar{j}$ then $\iint\limits_R \nabla \cdot \overline{v} \;\; dxdy =$ ....

(a) 0 (b) 2 (c) -1 (d) 1

(22) Parametric form of $x^2 + y^2 = z^2$ is $\bar{r} =$................

(a) $u\cos v\bar{i} + u\sin v\bar{j} + u\bar{k}(b)u\cos u\bar{i} + v\sin v\bar{j} + u\bar{k}$ (c) $u\cos v\bar{i} + v\sin u\bar{j} + v\bar{k}$

(d) $\cos v\bar{i} + \sin v\bar{j} + u\bar{k}$

(23) Parametric form of $x^2 + y^2 = z$ is $\bar{r} =$................

(a) $\sqrt{u}\cos v\bar{i} + \sqrt{u}\sin v\bar{j} + \sqrt{u}\bar{k}$ (b) $u\cos u\bar{i} + v\sin v\bar{j} + u\bar{k}$

(c) $\sqrt{u}\cos v\bar{i} + \sqrt{u}\sin v\bar{j} + u\bar{k}$ (d) $\cos v\bar{i} + \sin v\bar{j} + u\bar{k}$

(24) Parametric form of $x^2 + y^2 = a^2$ is $\bar{r} =$................

(a)$a\cos v\bar{i} + a\sin v\bar{j} + v\bar{k}$ **(b)** $a\cos u\bar{i} + a\sin u\bar{j} + v\bar{k}$ (c) $u\cos v\bar{i} + v\sin u\bar{j} + a\bar{k}$

(d) $\cos v\bar{i} + \sin v\bar{j} + a\bar{k}$

(25) Parametric form of the plane $y = x$ is $\bar{r} =$.................

(a) $u\bar{i} + v\bar{j} + u\bar{k}$ **(b)** $u\bar{i} + u\bar{j} + v\bar{k}$ (c) $v\bar{i} + u\bar{j} + v\bar{k}$ (d) $u\bar{i} + \bar{j} + v\bar{k}$

(26) Parametric form of surface $z = xy$ is $\bar{r} =$.................

(a) $u\bar{i} + v\bar{j} + uv\bar{k}$ (b) $u\bar{i} + v\bar{j} + v\bar{k}$ (c) $v\bar{i} + u\bar{j} + v\bar{k}$ (d) $u\bar{i} + \bar{j} + v\bar{k}$

(27) Area of a surface $\bar{r}(u, v)$ is A = ...

(a) $\iint_R \sqrt{EG - F^2}\, dxdy$ (b) $\iint_R \sqrt{EG + F^2}\, dxdy$ **(c)** $\iint_R \sqrt{EG - F^2}\, dudv$
(d) $\iint_R \sqrt{EG - F}\, dudv$

(28) Moment of inertia I_x ,of surface S of density $\sigma(x, y, z)$ is given by $I_x =$ ....

(a) $\iint_S (y + z)\sigma(x, y, z)\, dA$ (b) $\iint_S (y^2 + x^2)\sigma(x, y, z)\, dA$ (c) $\iint_S (x^2 + z^2)\sigma(x, y, z)\, dA$
(d) $\iint_S (y^2 + z^2)\sigma(x, y, z)\, dA$

(29) Moment of inertia I_y ,of surface S of density $\sigma(x, y, z)$ is given by $I_y =$ ....

(a) $\iint_S (x + z)\sigma(x, y, z)\, dA$ (b) $\iint_S (y^2 + x^2)\sigma(x, y, z)\, dA$ **(c)** $\iint_S (x^2 + z^2)\sigma(x, y, z)\, dA$
(d) $\iint_S (y^2 + z^2)\sigma(x, y, z)\, dA$

(30) Moment of inertia I_z ,of surface S of density $\sigma(x, y, z)$ is given by $I_z =$ ....

(a) $\iint_S z^2\, dA$ **(b)** $\iint_S (x^2 + y^2)\sigma(x, y, z)\, dA$ (c) $\iint_S z^2\sigma(x, y, z)\, dA$ (d) $\iint_S (x^2 + y^2)\ dA$

(31) If $\bar{r} = u\cos v\ \bar{i} + u\sin v\ \bar{j} + u\ \bar{k}$ then $\bar{r}_u \cdot \bar{r}_u =$ ....
(a) 2 (b) 0 (c) 1 (d) u^2

(32) If $\bar{r} = u\cos v\ \bar{i} + u\sin v\ \bar{j} + u\ \bar{k}$ then $\bar{r}_u \cdot \bar{r}_v =$ ....
(a) 2 **(b)** 0 (c) 1 (d) u^2

(33) If $\bar{r} = u\cos v\ \bar{i} + u\sin v\ \bar{j} + u\ \bar{k}$ then $\bar{r}_v \cdot \bar{r}_v =$ ....
(a) 2 (b) 0 (c) 1 **(d)** u^2

(34) If $\bar{r} = u\cos v\ \bar{i} + u\sin v\ \bar{j} + u\ \bar{k}$ then $EG - F^2 =$ ....
(a) 2 (b) 0 **(c)** $2u^2$ (d) u^2

(35) If $\bar{r} = u\ \bar{i} + v\ \bar{j} + uv\ \bar{k}$ then $\bar{r}_u \cdot \bar{r}_u =$ ....
(a) $1 + v^2$ (b) $1 - v^2$ (c) $1 + v^2 + u^2$ (d) $1 + u^2$

(36) If $\bar{r} = u\ \bar{i} + v\ \bar{j} + uv\ \bar{k}$ then $\bar{r}_u \cdot \bar{r}_v =$ ....
(a) $1 + v^2$ **(b)** uv (c) $1 + v^2 + u^2$ (d) $1 + u^2$

(37) If $\bar{r} = u\ \bar{i} + v\ \bar{j} + uv\ \bar{k}$ then $\bar{r}_v \cdot \bar{r}_v =$ ....
(a) $1 + v^2$ (b) uv (c) $1 + v^2 + u^2$ **(d)** $1 + u^2$

(38) If $\bar{r} = u\ \bar{i} + v\ \bar{j} + uv\ \bar{k}$ then $EG - F^2 =$ ....
(a) $1 + v^2$ (b) uv **(c)** $1 + v^2 + u^2$ (d) $1 + u^2$

(1) In Divergence theorem , $\iiint_R \bar{\nabla} \cdot \bar{u}\, dv =$ ....

(a) $\int_S \bar{u} \cdot \bar{n}\, dA$ (b) $\iint_S \bar{u} \times \bar{n}\, dA$ (c) $\iint_S \bar{u} \cdot \bar{n}\, dV$ **(d)** $\iint_S \bar{u} \cdot \bar{n}\, dA$

(2) In usual notation $\iiint_R \nabla^2 f\, dv =$ ....

(a) $\iint_S \frac{\partial f}{\partial n}\, dA$ (b) $\int_S \frac{\partial f}{\partial n}\, dA$ (c) $\iiint_S \frac{\partial f}{\partial n}\, dA$ (d) $\iint_S \frac{df}{dn}\, dA$

(3) If f is harmonic function then $\iint_S \frac{\partial f}{\partial n}\, dA =$ ....

(a) 1 **(b)** 0 (c) -1 (d) 2

(4) A function $f(x, y, z)$ is said to be harmonic if $\nabla^2 f =$ ....
(a) 1 (b) 2 (c) -1 **(d)** 0

(5) The first form of Green's theorem is $\iiint_R [f\bar{\nabla}^2 g + \bar{\nabla} f \cdot \bar{\nabla} g]dV =$ ....

(a) $\iint_S g\frac{\partial f}{\partial n}\, dA$ (b) $\int_S \frac{\partial f}{\partial n}\, dA$ **(c)** $\iint_S f\frac{\partial g}{\partial n}\, dA$ (d) $\iint_S f\frac{dg}{dn}\, dA$

(6) The second form of Green's theorem is $\iiint_R [f\bar{\nabla}^2 g - g\bar{\nabla}^2 f]dV =$ ....

(a) $\iint_S \left[g\frac{\partial f}{\partial n} - f\frac{\partial g}{\partial n}\right] dA$ (b) $\iint_S \left[g\frac{\partial g}{\partial n} - f\frac{\partial f}{\partial n}\right] dA$ (c) $\iint_S f\frac{\partial g}{\partial n}\, dA$ **(d)** $\iint_S \left[f\frac{\partial g}{\partial n} - g\frac{\partial f}{\partial n}\right] dA$

(7) In triple integral ,total mass of density $\sigma(x, y, z)$ in region R is given by M = ...
(a) $\iiint_R \sigma^2\, dxdydz$ (b) $\iiint_R dxdydz$ **(c)** $\iiint_R \sigma\, dxdydz$ (d) $\iiint_R 2\sigma\, dxdydz$

(8) In triple integral ,moment of inertia I_x of density $\sigma(x, y, z)$ in region R is given by $I_x =$ ....
(a) $\iiint_R (y^2 + z^2)\sigma\, dxdydz$ (b) $\iiint_R dxdydz$ (c) $\iiint_R x\sigma\, dxdydz$ (d) $\iiint_R x^2\sigma\, dxdydz$

(9) In triple integral , volume of the region R is given by V = ...
(a) $\iiint_R (y^2 + z^2)\sigma\, dxdydz$ **(b)** $\iiint_R dxdydz$ (c) $\iiint_R x\sigma\, dxdydz$ (d) $\iiint_R x^2\sigma\, dxdydz$

(10) In Stoke's theorem ,$\iint_S (\nabla \times \overline{v}) \cdot \overline{n}\ \ dA =$ ....

(a) $\int_C \overline{v} \cdot \overline{t}\ \ ds$ (b) $\int_C \overline{v} \times \overline{t}\ \ ds$ (c) $\int_C \overline{v} \cdot \overline{n}\ \ ds$ (d) $\int_C \overline{v} \times \overline{n}\ \ ds$

(11) $\int_0^1 \int_0^1 \int_0^1 dxdydz =$ ....
(a) 1 (b) 0 (c) 3 (d) 2

(12) $\int_0^1 \int_0^2 \int_0^3 dxdydz =$ ....
(a) 1 **(b)** 6 (c) 3 (d) 2

(13) $\int_0^1 \int_0^1 \int_0^1 x\, dxdydz =$ ....
(a) 1 (b) 0 (c) 2 **(d)** 1/2

(14) $\int_0^1 \int_0^1 \int_0^2 x\, dxdydz =$ ....
(a) 1 (b) 0 **(c)** 2 (d) 1/2

(15) $\int_0^1 \int_0^1 \int_0^1 xyz \, dxdydz =$ ....

(a) 8 **(b)** 1/8 (c) 1/2 (d) 1/4

(16) If surface $S : z = 3$ then unit normal vector $\bar{n} =$ ....

(a) 3 (b) $\bar{i}$ (c) $\bar{j}$ **(d)** $\bar{k}$

(17) If $\bar{n} = \bar{k}$ then $dA =$ ....

(a) 0 (b) $dxdz$ **(c)** $dxdy$ (d) $dydz$

(18) If $\bar{n} = \bar{i}$ then $dA =$ ....

(a) 0 (b) $dxdz$ (c) $dxdy$ **(d)** $dydz$

(19) If $\bar{n} = \bar{j}$ then $dA =$ ....

(a) 0 **(b)** $dxdz$ (c) $dxdy$ (d) $dydz$