MATHS-6B

SEMESTER-5

LONGS

Short tricks4U

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* UNIT-1 :-

① Evaluate $\iint xy(x+y)\,dx\,dy$ over the area between $y=x^2$, $y=x$ [Pg.NO.21]

☆ ② Change the order of integration and evaluate $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} dx\,dy$.

Answer → [Pg.NO.29]

☆ ③ Change into the polar Co-ordinates and evaluate

$$\int_0^a \int_0^{\sqrt{a^2-x^2}} e^{-(x^2+y^2)}\,dx\,dy.$$

Ans → [Pg.NO.30]

④ Evaluate $\int_0^4 \int_{y^2/4}^{y} \frac{y}{x^2+y^2}\,dx\,dy$ [Ans → Pg.NO.14]

* UNIT-2 :-

☆ ① Evaluate $\iiint xyz\,dx\,dy\,dz$ over the positive octant of the sphere $x^2+y^2+z^2=a^2$.

☆ ② Find the Volume bounded by the ellipse Parabolids $z=x^2+3y^2$ and $z=8-x^2-y^2$.

☆ ③ Using cylindrical Co-ordinates, find the Volume of the sphere $x^2+y^2+z^2=a^2$.

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UNIT-3 :-

① If $a = x+y+z$, $b = x^2+y^2+z^2$, $c = xy+yz+zx$. Then P.T. $[\text{grad } a \ \ \text{grad } b \ \ \text{grad } c] = 0$ [Pg.NO.3]

② Find the Directional derivative of the function $xy^2+yz^2+zx^2$ along the tangent to the Curve $x=t$, $y=t^2$, $z=t^3$ at $(1,1,1)$. [Pg.NO.5]

③ Find div f and Curl f where $f = \text{grad}(x^3+y^3+z^3-3xyz)$. [Pg.NO.7]

④ P.T. $\text{grad}(A\cdot B) = (B\cdot\nabla)A + (A\cdot\nabla)B + B\times \text{Curl } A + A\times \text{curl } B$ [Pg.NO.9]

⑤ P.T. $\nabla\times(\nabla\times A) = \nabla(\nabla\cdot A) - \nabla^2 A$

UNIT-4 :-

① Evaluate $\oint_C F\cdot dr$ where $F = 3x^2\bar{i} + (2xz-y)\bar{j} + z\bar{k}$ along the straight line 'c' from $(0,0,0)$ to $(2,1,3)$. [Pg.NO.3]

② If $\bar{F} = (x^2+y^2)\bar{i} - 2xy\bar{j}$. Evaluate $\int_C F\cdot dr$ where the Curve c is the rectangle in the xy plane bounded by $y=0$, $y=b$; $x=0$, $x=a$. [Pg.NO.4]

③ Evaluate $\int_S F\cdot N \, ds$ where $F = 2\bar{i} - 3y^2 z\bar{k}$ and 's' is the Surface $x^2+y^2=16$ included in the first Octant between $z=0$ and $z=5$. [Pg.NO.6]

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④ Evaluate $\int_S F \cdot N \, ds$ where $F = 18z\bar{i} - 12\bar{j} + 3y\bar{k}$ and 's' is the part of the plane $2x + 3y + 6z = 12$ located in the first octant. [Pg. NO. 8]

⑤ If $F = 2xz\bar{i} - x\bar{j} + y^2\bar{k}$. Evaluate $\int F \, dv$ where, v is the region bounded by the surfaces $x=0, x=2$ $y=0, y=6, z=x^2, z=4$. [Pg. NO. 11]

*UNIT-5:

① State and Prove Gauss divergence theorem. [Pg. NO. 3]

② State and Prove Green's theorem in a plane. [Pg. NO. 7]

③ State and Prove Stokes theorem. [Pg. NO. 10]

④ Verify Gauss Divergence theorem to evaluate $\int_S ((x^3 - yz)\bar{i} - 2x^2y\bar{j} + z\bar{k}) \cdot N \, ds$ over the surface of a cube bounded by the co-ordinate planes $x = y = z = a$. (Pg. 16)

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SHORTS

* UNIT-1 :-

① Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{1}{1+x^2+y^2}\, dx\, dy$ [Pg.NO.6]

② Evaluate $\int_0^2 \int_0^x e^{x+y}\, dy\, dx$ [Pg.NO.11]

③ Evaluate i, $\int_0^1 \int_0^y e^{x/y}\, dx\, dy$ (Pg.NO.12)

ii, $\int_0^1 \int_{\sqrt{y}}^{2-y} x^2\, dx\, dy$

④ Evaluate i, $\iint_R \frac{dx}{(1+x^2)(1+y^2)}$ over $[0,1\,;0,1]$

ii, $\int_0^a \int_0^b (x^2+y^2)\, dx\, dy$

iii, $\int_0^3 \int_0^1 (x^2+3y^2)\, dx\, dy$ [Pg.NO.16]

* UNIT-2 :-

① Find $\int_0^1 \int_0^1 \int_0^1 dx\, dy\, dz$

② Evaluate $\int_0^1 dx \int_2^2 dy \int_1^2 x^2 yz\, dz$

③ Evaluate the Triple integral $\int_0^1 \int_y^1 \int_0^{1-x} x\, dz\, dx\, dy$

④ Evaluate $\int_0^1 \int_0^1 \int_0^1 xyz\, dx\, dy\, dz.$

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*UNIT-3 :-

① If $A = 5t^2\bar{i} + t\bar{j} - t^3\bar{k}$ and $B = \sin t\,\bar{i} - \cos t\,\bar{j}$

i) $\frac{d}{dt}(A \cdot B)$ ii) $\frac{d}{dt}(A \times B)$ iii) $\frac{d}{dt}(A \cdot A)$ [Pg.NO.14]

② If $\phi = 2xz^4 - x^2y$ find the value of $\left| \frac{\partial\phi}{\partial x}\bar{i} + \frac{\partial\phi}{\partial y}\bar{j} + \frac{\partial\phi}{\partial z}\bar{k} \right|$ at $(2,-2,1)$. [Pg. NO. 15]

③ S.T. $3y^4z^2\bar{i} + 4x^3z^2\bar{j} - 3x^2y^2\bar{k}$ is Solenoidal. [Pg.NO.17]

* UNIT-4 :-

① Find $\oint_c F \cdot dr$ where $F = xy\bar{i} + yz\bar{j} + zx\bar{k}$ and the Curve c is $\bar{r} = t\bar{i} + t^2\bar{j} + t^3\bar{k}$, 't' varying from -1 to 1. [Pg.14]

② If $F = (3x^2+6y)\bar{i} - 14yz\bar{j} + 20xz^2\bar{k}$, Calculate $\oint_c F \cdot dr$ along the lines from $(0,0,0)$ to $(1,0,0)$ then to $(1,1,0)$ to $(1,1,1)$. (Pg.16)

③ If $\bar{F} = 3xy\bar{i} - y^2\bar{j}$ evaluate $\int_c F \cdot dr$ where c is the Curve $y = 2x^2$ in xy plane from $(0,0)$ to $(1,2)$. (Pg.17)

* UNIT-5 :

① S.T. $\int_S (ax\bar{i} + by\bar{j} + cz\bar{k}) \cdot N\,ds = \frac{4\pi}{3}(a+b+c)$ where 's' is the Surface of the sphere $x^2+y^2+z^2=1$. [Pg.NO.26]

② Compute $\int_S (ax^2+by^2+cz^2)\,ds$ over the Sphere $x^2+y^2+z^2=1$ (Pg.27)

③ Evaluate $\oint_c (\cos x \sin y - xy)\,dx + (\sin x \cos y)\,dy$ by Green's theorem, 'c' is the Circle $x^2+y^2=1$. (Pg.29)