

V.P.& R.P.T.P.Science College.Vallabh Vidyanagar.

Internal Test

B.Sc. Semester III

US03CMTH01 (Advanced Calculus)

5/10/2013 , Saturday

1.00 p.m. to 2.30 p.m.

Maximum Marks: 30

Que.1 Fill in the blanks.

6

$$(1) \int_0^2 \int_0^y dx dy = \dots\dots\dots$$

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

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

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

(3) In usual notation we say that, $\iint_R \nabla^2 w \, dx dy = \dots\dots\dots$

(a) $\int_C \frac{\partial^2 w}{\partial n^2} \, ds$ (b) $\int_C \frac{dw}{dn} \, ds$ (c) $\frac{1}{2} \int_C \frac{\partial w}{\partial n} \, ds$ (d) 0

(4) If $\bar{v} = y\bar{i} + 4x\bar{j}$ then $\iint_R \nabla \cdot \bar{v} \, dx dy = \dots\dots\dots$

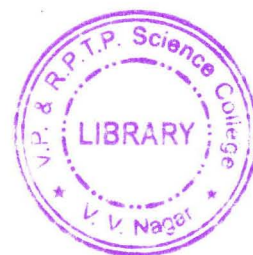
(a) 0 (b) 2 (c) -1 (d) 1

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

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

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

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



Que.2 Answer the following (Any three)

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(1) Evaluate $\int_C 3(x^2 + y^2) ds$, where

C : Over the path $y = x$ from (0,0) to (1,1) (counterclockwise direction) .

(2) Find area of the region bounded by $y = x^2$ and $y = 2x + 3$.

(3) Prove that area of plane region in cartesian form is given by $A = \frac{1}{2} \int_C [x dy - y dx]$.

(4) Evaluate the line integral $\int_{(2,0,0)}^{(1,2,3)} [x dx + y dy + z dz]$ on any path.

(5) Represent the surface $z^2 = x^2 + y^2$ in parametric form .

(6) By using divergence theorem , evaluate $\iint_S [x^2 dy dz + y^2 dz dx + z^2 dx dy]$,
 where S: The surface of cube $0 \leq x, y, z \leq 1$.

Que.3 Find volume of the region bounded by the tetrahedral cut from the first octant by the plane
 $3x + 4y + 2z = 12$.

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OR

Que.3 Find the centroid of density 1 in the plane area bounded by $y = 2x - x^2$ and $y = 3x^2 - 6x$. 6

Que.4 State and prove Green's theorem for plane . 6

OR

Que.4 Verify the result $\iint_R \nabla \cdot \vec{V} \, dxdy = \oint_C \vec{V} \cdot \vec{n} \, ds$
for $\vec{V} = 7x\vec{i} - 3y\vec{j}$, C : the circle $x^2 + y^2 = 4$.



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Que.5 State and prove divergence theorem of Gauss. 6

OR

Que.5 Find moment of inertia of surface S of density 1 about z -axis , where
 $S : \vec{r} = (a + b \cos v)(\cos u\vec{i} + \sin u\vec{j}) + b \sin v\vec{k}$, $a > b > 0$, $0 \leq u, v \leq 2\pi$. 6

