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This question paper contains 4+2 printed pages]	\square	
Roll No.		
S. No. of Question Paper : 92		
Unique Paper Code : 32351303	1	
Name of the Paper : C-7 Multivariate Calculus		
Name of the Course .: B.Sc. (Hons.) Mathematics	8	
Semester : III	Andres · 75	
Semester Maximum N Duration : 3 Hours		
(Write your Kill No. on the top immediately on receipt of this que	Supu Popula	
All sections are compulsory.		
All questions carry equal marks.		
Section		
At empt any six questions from this section		
1. Let f be the function defined by $f(x, y) = \frac{x}{y}$	$\frac{x^2 + 2y^2}{x^2 + y^2}$ for	
	н., Т	
$(x, y) \neq (0, 0).$		
(a) Find $\lim_{(x, y) \to (2, 1)} f(x, y)$.		
(b) Prove that f has no limit at $(0, 0)$.	P.T.O.	
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The temperature at the point (x, y) on a given metal plate

2.

3.

in the xy-plane is determined according to the formula $T(x, y) = x^3 + 2xy^2 + y$ degrees. Compute the rate at which the temperature changes with distance if we start at (2, 1) and move : parallel to the vector j. (a) (b) parallel to the vector i. The Company sells two brands X and Y of a commercial soap, in thousand-pound units. If x units of brand X and y units of brand Y are sold, the unit price for brand X is $p(x_{i}) = 4,000 - 500x$ and for brand Y is q(v) = 3,000 - 450y. Find the total revenue R in terms of p and q. (a)Suppose the brand X sells for \$ 500 per unit and brand (b) Y sells for \$ 750 per unit. Estimate the change in total revenue if the unit prices are increased by \$ 20 for brand X and \$ 18 for brand Y.

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show that

$$r\frac{\partial w}{\partial r} + s\frac{\partial w}{\partial s} = 0.$$

 $w = f\left(\frac{r-s}{s}\right),$

Find the directional derivative of $f(x, y) = e^{x^2y^2}$ at P(1, -1) in 5. the direction toward Q(2, 3).

Find the absolute extrema of $f(x, y) = 2 \sin x + 5 \cos y$ in the 6 rectangular region with vertices (0, 0), (2, 0), (2, 5) and (0, 5).

Let $\mathbf{R} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ and $\mathbf{r} = ||\mathbf{R}||$, evaluate $\operatorname{div}\left(\frac{1}{r^3}\mathbf{R}\right)$. 7.

Section II

Attempt any five questions from this section. By using iterated integral, compute

$$\iint\limits_{R} x\sqrt{1-x^2} e^{3y} dA$$

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where R is the rectangle $0 \le x \le 1, 0 \le y \le 2$.

9.

Evaluate the double integral :

$$\iint_{D} \frac{dn}{y^2 + 1}$$

where D is the triangular region bounded by y = -x and y = 2.

10. Evaluate the double integral

$$\int_{0}^{2} \int_{y}^{\sqrt{8-y^{2}}} \frac{1}{\sqrt{1+x^{2}+y^{2}}} \, dx \, dy$$

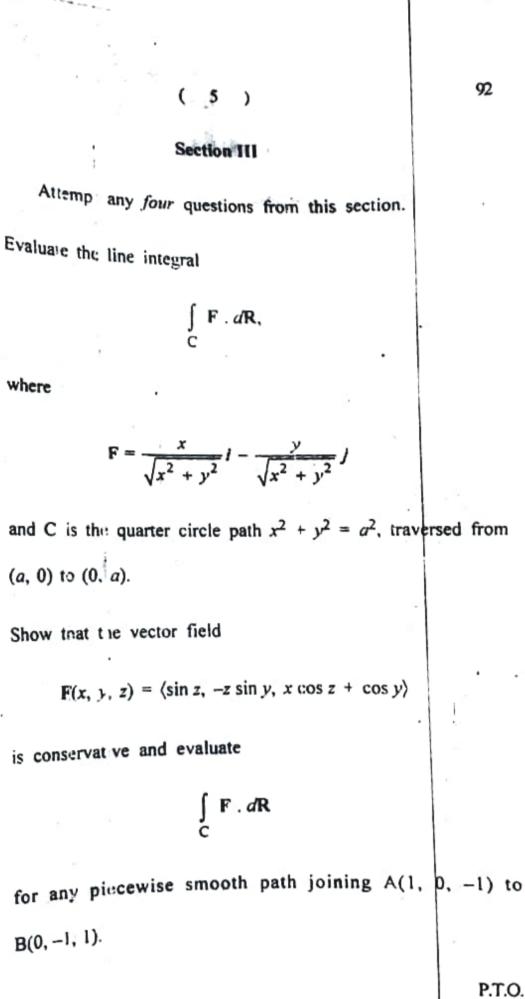
by converting to polar co-ordinates.

- 11. Find the volume of the tetrahedron T bounded by the plane 2x + y + 3z = 6 and the co-ordinates plane x = 0, y = 0 and z = 0.
 - 12. Find the volume of the solid D bounded by the paraboloid $z = 1 4(x^2 + y^2)$ and the xy-plane.
 - 13. Evaluate

$$\iint_{D} (x+y)^{5} (x-y)^{2} dy dx$$

by using change of variable u = x + y and v = x - y, where D'is the region in the xy-plane which is bounded by the co-ordinate axes and the sine x + y = 1.

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15.

P.T.O.