

(4)

Code No. : B-412(A)

OR

If $x = r \sin \theta \cos \phi$, $y = r \sin \theta \sin \phi$, $z = r \cos \theta$ then prove that

$$\frac{\partial(x, y, z)}{\partial(r, \theta, \phi)} = r^2 \sin \theta$$

Q.4 Evaluate $\int \frac{3x+5}{\sqrt{x^2+6x+5}} dx$

OR

Prove that $\int_0^{\pi/2} \log \sin x dx = -\frac{\pi}{2} \log 2$

Q.5 Prove that the whole length of the curve $x = a \cos^3 t$, $y = a \sin^3 t$ is $6a$.

OR

Change the order of integration in the following integral

$$\int_0^a \int_{\sqrt{ax-x^2}}^{\sqrt{ax}} V(x, y) dx dy.$$

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Roll No.....

Total No. of Section : 03

Total No. of Printed Pages : 04

Code No. : B-412(A)

Annual Examination - 2017

BCA-II

BCA-201

THEORETICAL FOUNDATION OF COMPUTER SCIENCE

Paper - II

DIFFERENTIATION AND INTEGRATION

Max.Marks : 50

Min Marks : 20

Time : 3 Hrs.

Note : Section 'A' containing 10 very short answer type questions, is compulsory. Section 'B' consists of short answer type questions and Section 'C' consists of long answer type questions. Section 'A' has to be solved first.

Section-'A'

Very short answer type questions. Answer in one or two lines. (1 x 10 = 10)

- Q.1 Write the n^{th} derivative of $\sin(ax+b)$
- Q.2 Write the statement of first mean value theorem.
- Q.3 Find the radius of curvature of the point (S, ψ) of the cycloid $S = 4a \sin \psi$.
- Q.4 Write the condition for point of inflexion.
- Q.5 If $f(x, y) = 2x^2 - xy + 2y^2$ then find $f_x(1, 2)$
- Q.6 If $u = ax + by$ and $v = cx + dy$ then find $\frac{\partial(u, v)}{\partial(x, y)}$.
- Q.7 Find the value of $\int \sin^7 x dx$.

P.T.O.

(2)

Code No. : B-412(A)

Q.8 Evaluate $\int \tanh^2 2x dx$.Q.9 Change the order of integration $\int_0^a \int_0^x f(x, y) dx dy$.Q.10 Evaluate $\int_0^1 \int_0^2 (x+y) dx dy$.**Section-'B'****Short answer type questions with word limit 150-200****(3x5=15)**Q.1 Verify Rolle's theorem in the interval [2,4] for the function $f(x) = x^2 - 6x + 8$.**OR**If $y = \sin(m \sin^{-1} x)$ then show that $(1-x^2)y_2 - xy_1 + m^2y = 0$.Q.2 Find the asymptotes of $x^2 + 3xy + 2y^2 + 3x - 2y + 1 = 0$.**OR**Find the interval of concavity and the points of inflexion for the curve $y = 3x^3 - 5x$.Q.3 If $u = x^2 + y^2 + z^2$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 2u$.**OR**Find the directional derivative of $\phi = xy + yz + zx$ in the direction of the vector $i + 2j + 2k$ at the point $(1, 2, 0)$.Q.4 Show that $\int_0^{\pi/2} \frac{dx}{a^2 \cos^2 x + b^2 \sin^2 x} = \frac{\pi}{2ab}$.

(3)

Code No. : B-412(A)

OREvaluate $\int \frac{dx}{2x^2 + x - 1}$.Q.5 Find the value of $\int_1^2 \int_0^{\sqrt{2x-x^2}} x dx dy$.**OR**Find the complete area of circle $x^2 + y^2 = a^2$.**Section-'C'****Long answer type questions with word limit 300-350****(5x5=25)**Q.1 Expand $\sin x$ in powers of $(x - \pi/2)$.**OR**If $y^{1/m} + y^{-1/m} = 2x$, then prove that

$$(x^2 - 1)y_{n+2} + (2n+1)x \cdot y_{n+1} + (n^2 - m^2)y_n = 0$$

Q.2 Find the radius of curvature at any point (r, θ) of the cardioid $r = a(1 + \cos \theta)$.**OR**Trace the curve $y^2(2a-x) = x^3$ Q.3 If $u = e^{xyz}$, show that $\frac{\partial^3 u}{\partial x \partial y \partial z} = (1 + 3xyz + x^2y^2z^2)e^{xyz}$ **P.T.O.**