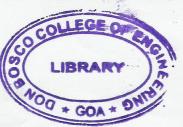


Time: 3 Hours

constant.



SEM 2-1 (RC 07-08)

F.E. (Sem. - II) Revised 2007-08 Course Examination, May/June 2015 APPLIED MATHEMATICS - II

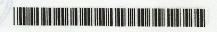
Max. Marks: 100 Instructions: i) Attempt any five question, at least one from each module. ii) Assume suitable data if necessary. c) Change the order of integral of - Independent of the phase of the p 1. a) Evaluate $\int_{0}^{\infty} \frac{\cos \lambda x}{x} \left(e^{-ax} - e^{-bx} \right) dx$ applying differentiation under the integral sign. 6 b) Find the length of the cycloid $x = 2(\theta + \sin \theta)$, $y = 2(1 - \cos \theta)$ between two cusp. 6 c) Find the curved surface area of the solid generated by the revolution about x-axis of $x(t) = 1 - \sin t + \frac{t}{\sqrt{5}}$, $y(t) = \frac{2}{\sqrt{5}} \cos t$, from t = 0 to $t = \pi/2$. 8 2. a) A moving object starts it motion from the point (1, 1, 2) with speed 3 in the direction $\bar{i} + \bar{k}$. It has constant acceleration $2\bar{i} + \bar{j}$. Find the position vector of the moving object at time t. 6 b) Find the principal normal N and the binomial B of $\bar{r}(t) = \sin t \, \bar{i} + (t+1) \bar{j} + \cos t \, \bar{k}$ at $t = \pi/2$. 6 $\int \cos^2 t \, \overline{i} + \sin t \, \overline{j} + \overline{k} dt \cdot \qquad \exists xy + \underline{i}(x + \underline{s}\underline{\epsilon}) + \underline{i}(\underline{s}\underline{y} + \underline{s}\underline{x}) = \overline{i}$ c) Evaluate 4

d) Define curvature. Show that the curvature of $r(t) = 2 \cos t \, i + 2 \sin t \, j$ is

4

(1, -2, 2)?

VRAGA:



MODULE - II

3. a) Evaluate $\iint_{10}^{1} \frac{1}{x^2 + y^2} dxdy$

6

8

10

- b) Evaluate $\int (3x + 2dxdy)$ over the region enclosed by y = x, y = 2x 2 and y = 0. 8
- c) Change the order of integration $\int_{10}^{3x} 2x + 3y \, dx \, dy$ and then evaluate. 6
- 4. a) The Loop of the curve $y^2 = x(2-x)^2$ is revolved about the x-axis. Find the volume of the object generated.
 - b) Evaluate the spherical coordinates integral $\int_{-\infty}^{\pi/2} \int_{-\infty}^{\pi/2} 3r^3 \cos^2\theta dr d\theta d\phi$. 6
 - c) Find the volume of the region enclosed $x^2 + y^2 = 4$ and $x^2 + z^2 = 4$.

MODULE – III

- 5. a) Define Curl of a vector field. Show that Curl $(\nabla \phi) = 0$ where ϕ is a scalar point function.
 - b) What is the greatest rate of change of $f(x, y, z) = 2x + 3z^2 + y^2$ at the point
 - c) Evaluate $\iint_{S} \nabla x \vec{F} \cdot \vec{n} ds$ where S is the triangle having vertices (1, 0, 0), (0, 2, 0) and (0, 0, 3). \vec{n} is the unit normal vector to the S and $\vec{F} = (x^2 + yz)\vec{i} + (3z + x)\vec{j} + yx\vec{k}$.
- 6. a) Verify Green's theorem in the plane for $\oint_C (x + 3y^2) dx + (2xy + 1) dy$ where C is the boundary of the region enclosed by $y^2 = 4x$ and x = 1. 8
 - b) Verify Gauss divergence theorem for $F = (z^2 + 2x)\vec{i} + (x + 2z^2)\vec{j} (y^2 + 3z)\vec{k}$, over the surface of the tetrahedron enclosed by the coordinate planes and the plane x + y + z = 1. 12

MODULE-IV

7. Solve the following differential equations:

20

a)
$$\frac{dy}{dx} - x^2 e^y = e^{2x+y}$$
.

b)
$$\frac{dy}{dx} + y \cot x = \cos x$$

c)
$$\frac{dy}{dx} = \frac{2y - x + 3}{4y - 2x + 2}$$
.

- d) (sec x tan x tan y e^{2x}) dx + sec x sec² ydy = 0.
- 8. Solve the following differential equations:

20

a)
$$(D^2 + D - 12)y = 2 \sin^2 x + 3$$
.

b)
$$(D^2 + 4)y = 4 Tan^2x$$
.

c)
$$(D^3 + 6D - 7)y = 5xe^{3x}$$
.

d)
$$x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^2 + 2\log x$$
.