B.E. (C.B.C.S. Pattern) Sem-II

2BEAB01 - Applied Mathematics-II

P. Pages : 2 **GUG/S/19/11471**

Time : Three Hours

* 3 3 7 6 *

Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Use of Non programmable calculator is permitted.

1. a) Solve $\frac{dy}{dx}\cos x + y\sin x = \sqrt{y\sec x}$. **4**

b) Solve $\left(1+e^{x/y}\right)dx + \left(1-x/y\right)e^{x/y}\,dy = 0$ **4**

c) Solve by method of Variation of Parameter. **8**

$$\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$$

OR

2. a) Solve $(1+y^2)dx = (\tan^{-1}y - x)\,dy$. **4**

b) Solve $(2xy\cos x^2 - 2xy + 1)\,dx + (\sin x^2 - x^2)\,dy = 0$ **4**

c) Solve $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = e^{2x} + x^2 + x$ **8**

3. a) Solve $\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} = A + B\log x$ **8**

b) Solve $\frac{d^2y}{dx^2} = \sec^2 y\tan y$ given that y = 0 and $\frac{dy}{dx} = 1$ when $x = 0$. **8**

OR

4. a) Solve $\frac{dx}{dt} + y = \sin t$ **8**

$$\frac{dy}{dt} + x = \cos t$$

given that x = 2, y = 0 when t = 0

b) Solve $(2x+3)^2\frac{d^2y}{d_x{}^2} - 2(2x+3)\frac{dy}{dx} - 12y = 6x$. **8**

5. a) Evaluate $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} dy\,dx$ **8**

by change of order of integration.

b) Evaluate $\int_1^3 \int_{1/x}^{1} \int_0^{\sqrt{xy}} xyz \, dz \, dy \, dx$ **8**

OR

6. a) Find by double integration the area lying between the Parabala $y = x^2 - 6x + 3$ and the line $y = 2x - 9$. **8**

b) Find the centre of gravity of the area in the first quadrant lying between the curves $y^2 = x^3$ and y = x. **8**

7. a) Find the unit tangent vector to any point on the curve. x = a coswt y = a sinwt z=at where a, b, w are constant. **4**

b) A particle moves along the curve $r = (t^3 - 4t)\hat{i} + (t^2 + 4t)\hat{j} + (8t^2 - 3t^3)\hat{k}$ where t is time. Find the magnitude of the tangential and normal components of its acceleration where t = 2. **6**

c) Find the directional derivatives of $\phi = x^2 + y^2 + 4xyz$ at the point (1, -2, 2) in the direction $2\hat{i} - 2\hat{j} + \hat{k}$. **6**

OR

8. a) Find the constant a and b so that the $ax^2 - 2byz = (a+4)x$ will be orthogonal to the surface $4x^2y + z^3 = 4$ at point (1, -1, 2) **6**

b) A particles moves so that its position vector is given by $\bar{r} = \cos wt \; \hat{i} + \sin wt \; \hat{j}$ where w is constant show that **6**

i) Velocity v of the particle is Perpendicular to $\hat{r}$.

ii) $\bar{r} \times \bar{v}$ = constant vector.

c) If $\bar{a} = t^2 i - tj + (2t+1)k$ and $\bar{b} = 2ti + j - tk$ then $\frac{d}{dt}(\bar{a} \times \bar{b})$ **4**

9. a) If $\bar{r}$ is the position vector, prove that **8**

i) $\nabla \cdot (r^n \bar{r}) = (n+3) r^n$ ii) $\nabla^2 (r^n) = n(n+1) r^{n-2}$

b) A vector field is given by **8**

$\bar{A} = (y^2 \cos x + z^3)\,\hat{i} + (2y \sin x - 4)\,\hat{j} + (3xz^2 + 2)\,\hat{k}$ show that the field is irrotational and find the Scalar potential.

OR

10. a) Evaluate $\iint_s \bar{f} \cdot \hat{n} \, ds$ by Gauss Divergence theorem s is the surface of cylinder $x^2 + y^2 = 4, z = 0, z = 3$ and $\bar{f} = 4x\hat{i} - 2y^2\hat{j} + 2^2\hat{k}$. **8**

b) Evaluate $\int_C \bar{F} \circ d\bar{r}$ by Stoke's theorem where C is boundary of the triangle with vertices (2, 0, 0) (0, 2, 0), (0, 0, 2) and $\bar{F}(x+y)i + (2x-z)j + (y+z)k$ **8**

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