B.E. / B.Tech. (Civil Engineering) Model Curriculum Semester-III

001 / BSC-CE301 - Mathematics-III (Transform & Discrete Mathematics)

P. Pages : 2 **GUG/W/24/13714**

Time : Three Hours * 5 3 9 1 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. All questions are compulsory.
3. Non programmable calculator is permitted.

1. a) Expand $f(x)=|\cos x|$ in a Fourier series in the interval $(-\pi,\pi)$. **8**

b) If $f(x)=|x|, -\pi<x<\pi$ then show that **8**

$$f(x)=\frac{\pi}{2}-\frac{4}{\pi}\left[\frac{\cos x}{1^2}+\frac{\cos 3x}{3^2}+\frac{\cos 5x}{5^2}+.....+\infty\right]$$

OR

2. a) Obtain half range cosine series for $f(x)=x-x^2$, for $0<x<1$. **8**

b) Expand f(x) as a Fourier series. **8**

$$f(x)=\begin{cases}-\pi, & -\pi<x<0\\ x, & 0<x<\pi\end{cases}$$

Hence show that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+....=\frac{\pi^2}{8}$

3. a) Solve $\frac{\partial^2 z}{\partial x^2}+2\frac{\partial^2 z}{\partial x,\partial y}-8\frac{\partial^2 z}{\partial y^2}=e^{2x+y}+\sqrt{2x+3y}$ **8**

b) Solve $\left(x^2-y^2-yz\right)p+\left(x^2-y^2-zx\right)q=z(x-y)$ **8**

OR

4. a) Solve $4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u$ given that $u=3e^{-y}-e^{-5y}$ when x=0 by using method of separation of variables. **8**

b) Solve $\left(D^2+DD'\right)z=\cos x,\cos 2y+\log(2x-2y)$. **8**

5. a) Find the inverse of matrix by method of partitioning if $A=\begin{bmatrix}2 & 3 & 4\\ 4 & 3 & 1\\ 1 & 2 & 4\end{bmatrix}$ **8**

b) Find the model of matrix B corresponding to matrix $A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$ & verify that **8**

$B^{-1}AB$ is diagonal form.

OR

6. a) Use Selvester's theorem to show that $\sec^2 A - \tan^2 A = I$ where $A = \begin{bmatrix} 2 & 4 \\ 3 & 1 \end{bmatrix}$ **8**

b) Verify Cayley-Hamilton theorem for given matrix $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ & express **8**

$A^6 - 4A^5 + 8A^4 - 12A^3 + 14A^2$ as a linear polynomial in A.

7. a) Solve by Gauss-Seidal method. **8**

$2x - 3y + 20z = 25$

$20x + y - 2z = 17$

$3x + 20y - z = -18$

b) Find a real root of the equation $4\sin x = e^x$ correct upto four decimal places by using False-Position method. **8**

OR

8. a) Solve **8**

$2x - 6y + 8z = 24$

$5x + 4y - 3z = 2$

$3x + y + 2z = 16$

by using Crout's method.

b) Find the real root of equation $x \log_{10} x - 1.2 = 0$ correct upto four decimal places by Newton Raphson method. **8**

9. a) If $\frac{dy}{dx} = \frac{1}{2}\left(y^2 + xy^2\right)$ given that $y(0) = 1$. Find the series solution upto four terms by using Taylor's series method & find y (0.1). **8**

b) Solve $\frac{dy}{dx} = \log(x + y)$ given that y(0) = 2 taking h = 0.2 find y (0.4) by using Euler's modified method. **8**

OR

10. a) If $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ to evaluate y(0.4) in steps of h = 0.2 by Runge-Kutta fourth order method. **8**

b) Find $y(0.4)$ & (0.5) by Milne's predictor method if **8**

$\frac{dy}{dx} = 2e^x - y, y(0) = 2,\ y(0.1) = 2.0100,\ y(0.2) = 2.0401,\ y(0.3) = 2.0907$.

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