B.E.(with Credits)-Regular-Semester 2012-Civil Engineering Sem III

ASH3011 - Engineering Mathematics-III

P. Pages : 3 **GUG/W/16/3674**

Time : Three Hours Max. Marks : 80

* 3 5 9 4 *

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

1. a) Obtain the Fourier series for the function **8**

$$F(x) = \begin{cases} 0 & ; -\pi \le x < 0 \\ \sin x & ; 0 \le x \le \pi \end{cases}$$

Hence show that

$$F(x) = \frac{1}{\pi} - \frac{2}{\pi}\sum_{n=1}^{\infty} \frac{\cos 2nx}{4n^2 - 1} + \frac{1}{2}\sin x$$

b) Obtain the Fourier series for function **8**

$$F(x) = \begin{cases} -\sin\left(\frac{\pi x}{L}\right) ; -L < x < 0 \\ \sin\left(\frac{\pi x}{L}\right) ; 0 < x < L \end{cases}$$

Hence show that $\frac{1}{2} = \frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + ----$

OR

2. a) Find the Fourier for function $F(x) = x^2; -\pi \le x \le \pi$. Hence find sum of series $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2}$. **8**

b) Find the half range sine series for the function **8**

$$F(x) = \begin{cases} x & ; 0 \le x \le 2 \\ 4 - x & ; 2 \le x \le 4 \end{cases}$$

3. a) Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} - 2\frac{\partial^2 z}{\partial y^2} = (y+1)e^x - \cos(2x+y)$ **8**

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

OR

4. a) Solve $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial y^2} = \frac{4x}{y^2} - \frac{y}{x^2}$ **7**

b) Solve $\left(\frac{y-z}{yz}\right)p + \left(\frac{z-x}{zx}\right)q = \left(\frac{x-y}{xy}\right)$, $p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$ **5**

c) Solve tan x p + tan y q = tan z where $p = \frac{\partial z}{\partial x}$ $q = \frac{\partial z}{\partial y}$ **4**

5. a) Find the inverse of matrix $A = \begin{bmatrix} 4 & -5 & 6 \\ -1 & 2 & 3 \\ -2 & 4 & 7 \end{bmatrix}$ by partitioning method. **8**

b) Verify the cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence find **8**

$A^6 - 6A^5 + 9A^4 - 2A^3 - 12A^2 + 23A - 9I$.

OR

6. a) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 5 & 7 & -5 \\ 0 & 4 & -1 \\ 2 & 8 & -3 \end{bmatrix}$ **8**

Also write modal matrix and diagonal matrix.

b) Use Sylvester's theorem, find A^{-2} where $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$. **8**

7. a) Find the real root of equation $2x - \log_{10} x = 7$ which is nearer to 3.8 correct upto 4 decimal places by iteration method. **8**

b) Solve by Crout's method **8**

$$4x + y - z = 13$$
$$3x + 5y + 2z = 21$$
$$2x + y + 6z = 14$$

OR

8. a) Find the real root of equation $\sin x - \frac{x+1}{x-1} = 0$ by False position method. **8**

b) Solve system of equations **8**

$$-9x + 3y + 4z + 100 = 0$$
$$x - 7y + 3z + 80 = 0$$
$$2x + 3y - 5z + 60 = 0$$

by Gauss-Seidal iteration method

9. a) Solve the differential equation $\frac{dy}{dx} = 2x - y$ given that y (1) = 3 by Picards method upto third approximation Hence find $y(2.1)$ & $y(2.2)$. **8**

b) Solve $10\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ to evaluate y (0.4) in steps of h = 0.2 by Runge kutta Fourth order method. **8**

OR

10. a) Find y(0.4), y(0.5) by Milne's Predictor-Corrector method $\frac{dy}{dx} = 2e^x - y$, $y(0) = 2$, y (0.1) = 2.010, y (0.2) = 2.040, y(0.3) = 2.090. **8**

b) Solve $\frac{dy}{dx} = 2y + 3e^x$, given that y (0) = 0, Using Taylor's series method and find value of y (0.1) & y (0.2). **8**

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