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Total Number of Pages : 02

B.TECH

B.TECH 1<sup>ST</sup> SEMESTER REGULAR EXAMINATIONS, DECEMBER 2017

ENGINEERING MATHEMATICS - I

Subject Code: BBSBS1010

Time: 3 Hours

Max Marks : 100

The figures in the right hand margin indicate marks.

**PART-A****(10X1 = 10 MARKS)****Answer all questions.**

- The necessary and sufficient condition for exactness of the equation  $Mdx + Ndy = 0$  is \_\_\_\_\_.
- Write the general solution of the Differential equation  $y'' + 2y' + y = 0$  having equal roots is \_\_\_\_\_.
- The function  $\sin(n\pi x/L)$  is an \_\_\_\_\_ Function in the interval  $(-L, L)$ .
- If  $f(x)$  is an odd function then the value of  $\int_{-a}^a f(x) dx$  is \_\_\_\_\_.
- The standard form of Euler – Cauchy differential equation of second order is \_\_\_\_\_.
- The value of  $\sin n\pi =$  \_\_\_\_\_.
- The series of  $e^x$  is \_\_\_\_\_.
- The Eigen Values of a symmetric matrix are \_\_\_\_\_.
- What is the order of differential equation  $y'^2 + y = 0$ .
- The fourier series of  $f(x)$  in the period  $2L$  is \_\_\_\_\_.

**PART-B****(15 x 2 = 30 MARKS)****Answer any fifteen questions from the following.**

- Define algebraic and geometric multiplicity of an Eigen value.
- What is the integrating factor of the equation  $y' + 2xy = x^2$
- Write the formula for particular solution of variation of parameter.
- Write the Bernoulli's equation.
- Test the exactness of the differential equation  $x \sin(y^2) dx + y x^2 \cos(y^2) dy = 0$ .
- Solve  $x y'' + 2y' = 0$
- Check for even and odd function for  $f(x) = x + x^2$
- Define half range sine series.
- Express the function  $f(x) = 3x^2$ ,  $-1 < x < 1$  in Fourier series
- Solve the initial value problem  $y' - e^x y = 0$  with  $y(0) = 1$
- Find the total derivative of  $u = e^x y$
- Define Lagrange's Mean value theorem.
- Check the matrix  $\begin{pmatrix} i & 1+i \\ -1+i & -2i \end{pmatrix}$  is skew-hermitian matrix or not.
- Draw the graph of  $|x|$ ,  $0 < x < 2$

15. Define rank of matrix. What is its basic importance .
16. Find the spectrum and spectral radius of the matrix  $\begin{pmatrix} 1 & 1 \\ 2 & 2 \end{pmatrix}$
17. Define Rolle's theorem.
18. Define stationary point.
19. Define hermitian and skew-hermitian matrix.
20. Find the value of c by mean value theorem for  $f(x)=2x^2+3x+4$  in  $[1, 2]$ .

**PART-C****(6 x 5 = 30 MARKS)****Section-i****Answer any Six questions**

1. Solve  $x y' = (y - x)^2 + y$
2. Solve  $\frac{dy}{dx} - \left(1 + \frac{3}{x}\right) y = x + 2$
3. Verify  $f_{yx} = f_{xy}$  where  $f = \sin(2x^2 + y^2)$
4. Find the rank of the matrix  $\begin{bmatrix} 3 & -1 & 3 \\ 2 & -4 & 6 \\ 10 & 0 & 14 \end{bmatrix}$
5. Expand  $f(x) = x$  in the Fourier series in  $-\pi < x < \pi$ .
6. Solve  $y'' + 3y' - 18y = 9 \sin x$  by using undetermined coefficient method.
7. Expand  $\sin x$  in powers of  $\left(x - \frac{\pi}{2}\right)$  by Taylor's Series.
8. State and Prove Euler's theorem on homogeneous function.

**Section-ii****Answer any Two questions****(2 x 15 = 30 MARKS)**

- 1 (a) Find the extreme values of the function  $u = \sin x + \sin y + \sin(x+y)$   
 (b) Verify Euler's theorem for  $z = a x^2 + 2h x y + b y^2$
- 2.(a) Solve  $3 y'' + 10 y' + 3 y = 9x + 5 \cos x$   
 (b) Solve  $y'' - 4y' + 4y = \frac{e^{2x}}{x}$  by using variation of parameter.
- 3.(a) Find the Fourier series  $f(x) = \frac{x^2}{2}$  in  $-\pi < x < \pi$   
 (b) Find the Half-range sine series of  $f(x) = \pi - x$  in  $0 < x < \pi$
4. (a) Diagonalize  $\begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$   
 (b) Solve the system of linear equation by Gauss Elimination method  
 $-x + y + z = 2$  ,  $3x - y - z = 6$  ,  $-x + 3y + 4z = 4$

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