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II/IV B.Tech (Supplementary) DEGREE EXAMINATION

March, 2018

Third Semester

Time: Three Hours

Common to all Branches

Engineering Mathematics -III

Maximum: 60 Marks

Answer Question No.1 compulsorily.

(1X12 = 12 Marks)

Answer ONE question from each unit.

(4X12=48 Marks)

1. Answer all questions

(1X12=12 Marks)

- Define Fourier cosine and sine integrals.
- Find the Fourier transform of e^{-ax} .
- Write the complex form of Fourier integral.
- Write the initial condition of D'Alembert's solution of wave equation.
- Write the one dimension heat equation.
- Solve $U_{xy} = -U_x$.
- Write Newton's back ward interpolation formula.
- What is the order of the Newton iteration method?
- Distinguish between Lagrange and Newton's Divided Difference interpolations.
- Write the normal equations for $y = a + bx^2$ by least squares method.
- Define Laplace and Poisson equations.
- Write the standard and diagonal 5-point formulas for u_{ij} .

UNIT I

- Using Fourier integral show that $\int_0^{\infty} \frac{1 - \cos \pi \lambda}{\lambda} \sin \lambda x d\lambda = \begin{cases} \frac{\pi}{2}, & \text{if } 0 < x < \pi \\ 0, & \text{if } x > \pi \end{cases}$ 6M
 - Using Fourier integral show that $\frac{2}{\pi} \int_0^{\infty} \frac{\sin \lambda \cos \lambda x}{\lambda} d\lambda = \begin{cases} 1, & \text{if } |x| \leq 1 \\ 0, & \text{if } |x| > 1 \end{cases}$ 6M

(OR)

- Find the Fourier transform of $f(x) = \begin{cases} 1, & \text{if } |x| < a \\ 0, & \text{if } |x| > a \end{cases}$ and hence evaluate $\int_0^{\infty} \frac{\sin p}{p} dp$ 6M
 - Find the Fourier transform of $f(x) = \frac{e^{-ax}}{x}$. 6M

UNIT II

- Find the deflection $U(x, t)$ of a vibrating string of unit length with fixed ends starting with initial velocity zero for $f(x) = K[1 - \cos 2\pi x]$ Where $K=0.01$. 6M
 - Find the solution $u(x, y)$ of $u_{xx} - u_{yy} = 0$ by separating the variables. 6M
- Find the temperature $u(x, t)$ in a bar of silver of length 10 cm, constant cross section of area 1 cm^2 , density 10.6 gm/cm^3 , thermal conductivity $1.04 \text{ cal/(cm sec } ^\circ\text{C)}$, specific heat $0.056 \text{ cal/(gm } ^\circ\text{C)}$ that is perfectly insulated laterally, whose ends are kept at temperature 0°C and whose initial temperature (in $^\circ\text{C}$) is $f(x)$ where $f(x) = x(10 - x)$. 6M
 - Solve the Dirichlet's problem in a rectangle R. 6M

UNIT III

6. a) Find $y(25)$ given that $y(20) = 24$, $y(24) = 32$, $y(28) = 35$, $y(32) = 40$ using Newton's Forward interpolation formula. 6M
 b) Find the Lagrange's interpolation polynomial from the following data and hence find $y(4)$ 6M

x	0	1	2	3
y	2	3	12	147

(OR)

7. a) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ using Simpsons's rule and compare it with the exact value. 6M
 b) Using Newton's divided difference formula evaluate $y(9)$ given 6M

x	5	7	11	13	17
y	150	392	1452	2366	5202

UNIT IV

8. a) Solve the system of equations by using Gauss-seidel method
 $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$. 6M
 b) Solve $2x + 4y - 6z = -4$, $x + 5y + 3z = 10$, $x + 3y + 2z = 5$ using LU decomposition method. 6M

(OR)

9. a) Compute $y(0.1)$ and $y(0.2)$ by Runge-Kutta method of fourth order for the differential equation $\frac{dy}{dx} = x + y$, $y(0) = 1$. 6M
 b) Compute $y(0.1)$ in steps of 0.01 using Euler's method $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0)=1$. 6M