14MA301
BT/CE/CH/CS/EC/EE/EI/IT/ME 211

Hall Ticket Number:

II/IV B.Tech (Supplementary) DEGREE EXAMINATION

March, 2018 — **Common to all Branches**

Third Semester — **Engineering Mathematics -III**

Time: Three Hours — **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)
   a) Define Fourier cosine and sine integrals.
   b) Find the Fourier transform of e^{-ax}.
   c) Write the complex form of Fourier integral.
   d) Write the initial condition of D-Alembert's solution of wave equation.
   e) Write the one dimension heat equation.
   f) Solve Uxy= -Ux.
   g) Write Newton's back ward interpolation formula.
   h) What is the order of the Newton iteration method?
   i) Distinguish between Lagrange and Newton's Divided Difference interpolations.
   j) Write the normal equations for $y = a + bx^2$ by least squares method.
   k) Define Laplace and Poison equations.
   l) Write the standard and diagonal 5-point formulas for u_{ij}.

UNIT I

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

(OR)

3.
   a) 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
   b) Find the Fourier transform of $f\left(x\right)=\frac{e^{-ax}}{x}$. 6M

UNIT II

4. a) 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-cos2πx] Where K=0.01. 6M
   b) Find the solution u(x ,y) of $u_{xx} - u_{yy} = 0$ by separating the variables. 6M

(OR)

5. a) 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 1.04cal/(cm sec ^{0}C), specific heat 0.056 cal/(gm ^{0}C)) that is perfectly insulated laterally , whose ends are kept at temperature 0 ^{0}C and whose initial temperature (in ^{0}C) is f(x) where f(x) = x(10 – x). 6M
   b) 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