Code No: 114DD

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, May-2015
MATHEMATICS-II
(Common to ME, MCT, MIE, MSNT)

Time: 3 Hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

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PART- A   **(25 Marks)**

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1.a)   If $\bar{a} = a_1 i + a_2 j + a_3 k$ and $\bar{r} = xi + yj + zk$ then find $\nabla(\bar{r}.\bar{a})$ [2M]

  b)   State Stoke's Theorem.   [3M]

  c)   If $f(x) = \dfrac{1}{4}(\pi - x)^2$, $0 < x < 2\pi$ find a_0.   [2M]

  d)   If finite fourier cosine transform of f is $\dfrac{1}{n^2}[(-1)^n - 1]$ and $F_c(0) = \dfrac{\pi^2}{2}$ find $f(x)$.

                                                                                   [3M]

  e)   Prove that $\Delta\nabla = \delta^2$.   [2M]

  f)   If y(0) = 6, y(1) = 24, y(2) = 60 and y(3)=120, then find $\nabla^2 y_3$.   [3M]

  g)   Find an iteration formula to find the square root of a number by Newton
       Raphson method.   [2M]

  h)   Find the LU decomposition of $\begin{bmatrix} 2 & -3 & 1 \\ 3 & 4 & 2 \\ 2 & -3 & 4 \end{bmatrix}$.   [3M]

  i)   If $y_0 = 0$, $y_1 = 0.497$, $y_2 = 0.692$, $y_3 = 0.825$ $h = \dfrac{1}{4}$ then find $\displaystyle\int_0^{0.75} ydx$ by Simpsons

       $\dfrac{3}{8}th$ rule.   [2M]

  j)   If $y'' = 2y$, then find the recurrence relation among y_0, y_1, y_2, when h= 1.

                                                                                   [3M]

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PART - B   **(50 Marks)**

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2.   Prove that the function. $\bar{F} = (x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$ is irrotational
      and hence find scalar potential function corresponding to it.   [10]

<div align="center">**OR**</div>

3.   Evaluate $\displaystyle\iint \bar{F}.\bar{n}ds$ where $F = (x + y^2)i - 2x j + 2yzk$ and S is the surface of
      the plane $2x + y + 2z = 6$ in the first octant.   [10]

4.a) Find the fourier series to represent the function $f(x) = |\sin x|$ in $-\pi < x < \pi$.

b) Find the Fourier Transform of

$$f(x) = \begin{cases} \cos x & 0 < x < a \\ 0 & x \geq a \end{cases}$$ [5+5]

OR

5.a) Obtain a cosine series for the function $f(x) = \begin{cases} x, 0 \leq x \leq \dfrac{\pi}{2} \\ \pi - x, \ \dfrac{\pi}{2} \leq x \leq \pi \end{cases}$

b) Find the Fourier transform of $f(x) = \begin{cases} 1 - |x|, \text{ if } |x| < 1 \\ 0 \ \text{if } |x| > 1 \end{cases}$ [5+5]

6.a) Use Lagranges formula to obtain the value of t when A = 85 from the following table.

t	2	5	8	14
A	94.8	87.9	81.3	68.7

b) Fit the curve of the form y=a+bx by the method of least squares.   [5+5]

x	0	5	10	15	20	25
y	12	15	17	22	24	30

OR

7. Fit a curve of the form $y = ab^x$ by the method of least squares.   [10]

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

8.a) Find a root of the equation $\sin x = 1 - x$ using Newton Raphson method.

b) Explain the Geometric interpretation of Regula Falsi method.   [5+5]

OR

9. Solve the system of equations $x + y + z = 1$, $3x + y - 3z = 5$, $x - 2y - 5z = 10$ by writing the coefficient matrix as a product of a lower triangular and an upper triangular matrix.   [10]

10. Find y(0.1) and y(0.2) using Runge Kutta method given that $y' = x^2 - y$, $y(0) = 1$ [10]

OR

11. Solve the boundary value problem $y'' = x + y$, with h= 0.25 given that y(0) = 0, y(1)=1.   [10]

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