I B. Tech I Semester Supplementary Examinations, June, 2015
Mathematics for Biotechnology-I
(Bio Technology)

Time: 3 hours   Max Marks: 70

PART – A
Answer ALL questions. All questions carry equal marks
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10 * 2 Marks = 20 Marks

1. a Employ Euler's theorem to evaluate $xu_x + yu_y$ for the function $u = \dfrac{x^4 + x^2 y^2 + y^4}{x+y}$ **[2]**

b Evaluate the definite integral $\displaystyle\int_0^{\pi/2} \sin^2 x\, dx$ **[2]**

c Express the matrix $A = \begin{pmatrix} 5 & 4 \\ 6 & 9 \end{pmatrix}$ as the sum of a symmetric and a skew symmetric matrix. **[2]**

d Find the sum and product of the eigenvalues of the matrix $A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$ using properties. **[2]**

e Write the quadratic form corresponding to the symmetric matrix $A = \begin{pmatrix} 4 & -1 & 2 \\ -1 & 3 & 3 \\ 2 & 3 & 5 \end{pmatrix}$ **[2]**

f Find 'k' for the matrix $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \\ 3 & 9 & k \end{pmatrix}$ to have rank 2. **[2]**

g Compute $y'' + 4y$ for the periodic function $y = a\cos 2x + b\sin 2x$ **[2]**

h Solve the differential equation $\dfrac{dy}{dx} = e^{2x-3y}$ **[2]**

i Form the differential equation of the family of curves $y = ax + \dfrac{b}{x}$ **[2]**

j Find the particular integral of the differential equation y″-3y′+2y=2x. **[2]**

PART – B
Answer any FIVE questions. All questions carry equal marks
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5 * 10 Marks = 50 Marks

2. (a) Find the values of x for which $f'(x) = 0$ for the function. **[10]**

$f(x) = \dfrac{2x^3}{3} - \dfrac{5x^2}{2} + 2x + 3$. Evaluate $f''(x)$ at these points. **[6]**

(b) Evaluate the definite integral $\displaystyle\int_0^3 \dfrac{1}{\sqrt{x+1}}\,dx$ **[4]**

3. (a) Test for the consistency of the Linear Algebraic System given below and solve if **[10]** possible $x + y + 3z = 7,\ 2x - y + 2z = 9,\ x - y - z = 1$

(b) Compute A^{-1} by Cayley Hamilton Theorem for the matrix $A = \begin{pmatrix} 4 & -2 \\ -2 & 5 \end{pmatrix}$

4. Find the Eigen Values and Eigen Vectors of the matrix $A = \begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$ **[10]**

5. (a) Solve the Leibniz Linear Equation $x\dfrac{dy}{dx} + y = 1 + \cos x$ **[4]** **[10]**

(b) A metallic ball with initial temperature $180^0 C$ is placed in a room with temperature $50^0 C$. After 10 minutes, the temperature of the hot body drops to $120^0 C$. Apply the Newton's law of cooling to estimate when the temperature of the body drops to $90^0 C$. **[6]**

6. Solve the Linear Differential Equation $y'' - 10y' + 24y = 2x + \cos 3x$. **[10]**

7. (a) Given the function $u = \left(1 - 2xy + y^2\right)^{-1/2}$, prove that $x u_x - y u_y = y^2 u^3$ **[10]**

(b) Evaluate $\displaystyle\int e^x (\cos x - \sin x)\,dx$

8. Reduce the quadratic form given below to the Canonical Form using an Orthogonal **[10]** Transformation $\qquad x^2 + y^2 + 2z^2 - 2xy + 4zx + 4yz$

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