(20518)

B. Sc. (Micro.)-II Year

Roll No. ....

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B. Sc. (Micro.) Examination, May 2018

BIOMATHEMATICS

(B-207)

Time : Three Hours] · *[Maximum Marks : 40*

Note : Attempt any *five* questions. All question carry equal marks. Calculator and any type of tables are allowed.

1. (a) Use the method of cofactors, find the value of the determinant :

$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}.$$

   (b) Use Cramer's rule to solve the following system of equations :

$$3x + y - z = 1$$
$$5x + 2y + 3z = 2$$
$$8x + 3y + z = 3$$

(2)

2. (a) Define rank of a matrix. Find the rank of a matrix :

$$A = \begin{bmatrix} 2 & 4 & 1 \\ 2 & 1 & 2 \\ 1 & 0 & 3 \end{bmatrix}.$$

   (b) Determine the eigenvalues (characteristic values) of the matrix :

$$A = \begin{bmatrix} 3 & 2 \\ -1 & 0 \end{bmatrix}.$$

3. Apply Gauss Elimination method to solve the following equations :

$$2x_1 + 4x_2 + x_3 = 3$$
$$3x_1 + 2x_2 - 2x_3 = -2$$
$$x_1 - x_2 + x_3 = 6$$

4. (a) By using Newton-Raphson's method to find the root of $x^4 - x - 10 = 0$, which is nearer to $x = 2$, correct to three places of decimal.

   (b) Apply False position method to solve $3x - \cos x - 1 = 0$.

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5. (a) If $\tan A - \tan B = \dfrac{1}{2}$ and $\cot A - \cot B = \dfrac{1}{3}$, find the value of $\cot(A-B)$.

(b) Prove that :

$$\frac{\sin A}{1+\cos A} = \tan \frac{A}{2}.$$

6. (a) If A, B and C are the angles of a triangle and $\cos B + \cos C = 4\sin^2\left(\dfrac{A}{2}\right)$, then find the value of $\tan \dfrac{B}{2} \tan \dfrac{C}{2}$.

(b) Prove that :

$$\frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} = \tan 54^\circ.$$

7. (a) Evaluate :

$$\lim_{x \to 1} \frac{x^4 - 3x^2 + 2}{x^3 - 5x^2 + 3x + 1}.$$

(b) Find the derivative of the functions :

(i) $y = 7\sin x + 2\log x - e^x + (x^2 - 7x + 4)$

(ii) $y = (\cos x).(\log x).$

8. (a) Find the maximum and minimum values of the function f, defined by :

$$f(x) = (x-3)^2(x+3), \text{ for all } x \in R.$$

(b) Use implicit differentiation to find $\dfrac{dy}{dx}$, if :

$$x^2 = \frac{x-y}{x+y}.$$

9. (a) Evaluate :

$$\int \frac{5x - 13}{(x-3)(x-2)} \, dx.$$

(b) Evaluate :

$$\int \frac{\sin \theta \, d\theta}{\cos^2 \theta + \cos \theta - 2}.$$

10. (a) Evaluate :

$$\int \frac{2dx}{x\sqrt{(1 - 4\log^2 x)}}$$

(b) Evaluate :

$$\int x^5 e^x \, dx.$$