MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agricultural Engineering)

Semester	: I (New)	Term	: I	Academic Year	: 2019-20
Course No.	: BS-MATH 111				
Credits	: 3(2+1)	Title	: Engineering Mathematics-1		
Day & Date	: Thursday, 26.12.2019	Time	: 10.00 to 13.00	Total Marks	: 80

Note :
1. Solve **ANY EIGHT** questions from **SECTION "A"**.
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 a) Reduce the following matrix to its normal form and hence find its rank.

$$\begin{bmatrix} 2 & 3 & 1 & 4 \\ 1 & 2 & 2 & 3 \\ 0 & -1 & -3 & -2 \end{bmatrix}$$

b) Evaluate : $\lim_{x \to 0} \left[\frac{log\,(tan\,x)}{\log x}\right]$

Q.2 a) Using the Gauss- Jordan method, find the inverse of the following matrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$$

b) Expand $\log_e x$ in powers of (x-1) by Taylor's theorem.

Q.3 a) Find the directional derivative of $f(x,y,z) = x^2 - y^2 + 2z^2$ at the point P (1, 2, 3) in the direction of the vector $4I - 2J + K$.

b) Verify Euler's theorem for the function $f(x,y) = ax^2 + 2hxy + by^2$.

Q.4 Find Eigen value and Eigen vectors of the matrix

$$\begin{bmatrix} 8 & -4 \\ 2 & 2 \end{bmatrix}$$

Q.5 a) Evaluate : $\int_0^5 \int_0^{x^2} x(x^2 + y^2)\, dxdy$

b) Compute $\beta(\frac{7}{2}, \frac{-1}{2})$

Q.6 a) Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x\, dz\, dx\, dy$

b) Find div F and curl F at the point (2, -1,1) where

$F = (xyz)I + (3x^2y)J + (xz^2 - y^2z)K$

(P.T.O.)

Q.7 a) Find the work done in moving a particle in the force field

$F = 3x^2I + (2xz - y)J + zK$ along the straight line from (0,0,0) to (2,1,3)

b) Find the first and second order partial derivatives of $z = x^3 + y^3 - 3axy$.

Q.8 a) If $u = x \log xy$ where $x^3 + y^3 + 3xy = 1$ find $\frac{du}{dx}$.

b) Find the unit vector normal to the surface $xy^3z^2 = 4$ at the point (-1,-1, 2).

Q.9 a) Evaluate $\int_0^\infty \sqrt{x}\, e^{-x^3} dx$

b) If $u = f(x - y, y - z, z - x)$ prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.

Q.10 Test the consistency of the following equations and solve

$5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5$.

SECTION "B"

Q.11 Define the following terms.

1) L' Hospitals rule
2) Rank of the matrix
3) Eigen values of a matrix
4) Beta function
5) Scalar point function
6) Euler's theorem
7) Gradient of a scalar point function
8) Normal form of a matrix

Q.12 Fill in the blanks.

1) $\Gamma(n+1) =$ _____, provided n is positive integer.

2) $\log(1+x) = x - x^2/2 +$ _____.

3) If $rt-s^2>0$ and $r>0$ at (a,b) then f(a,b) is _____.

4) If $u = x^y$ then $\frac{\partial u}{\partial x} =$ _____.

5) $\Gamma(1/2) =$ _____.

6) Curl grad f = _____.

7) If Y= AX is an orthogonal transformation then A' = _____.

8) The product of the eigen values of a matrix A is equal to its_____.

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