MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION
B.Tech.(Agril.Engg.)

.Semester	: I (Old)	Academic Year: 2019-20	
Course No.	: BS-MATH-111	Title: Engineering Mathematics-I	
Credits	: 3(2 +1)		
Day & Date	: 26-12-2019 THU	Time : 10.00 to 13.00 hrs	Total Marks: 120

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) Expand $e^{\sin x}$ by Maclaurin's series upto the term containing x^4.

b) Evaluate : $\int_0^\infty e^{-x^2}\,dx$

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

b) Find minimum value of function $f(x,y) = x^2 + y^2 + 6x + 14$.

Q.3 a) Solve $(D^2 - 5D + 6)\,y = 0$.

b) If $F = 4x^2i + 6\,xyj + xyzk$, find div F and curl F at the point (1,2,4).

Q.4 a) Solve $\frac{dy}{dx} + x\sin 2y = x^3\cos^2 y$.

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

Q.5 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) If $u = x^3 + y^3 - 3axy$, prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 6\,(x + y)$.

Q.6 a) Evaluate the $\lim_{x\to 0} \frac{(e^x-1)-x}{xe^x-x}$

b) Solve $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$

Q.7 a) Evaluate $\int_3^4 \int_1^2 (xy + e^y)dxdy$

b) Evaluate $\int_0^1 dx \int_0^2 dy \int_1^2 x^2yz\,dz$

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

b) Solve $\frac{dy}{dx} + x^2y = x^5$

Q.9 Solve $(D^2 + D - 2)\,y = 2x$

Q.10 Find by double integration the smaller of the area bounded by the circle $x^2 + y^2 = 9$ and the straight line $x + y = 3$

(P.T.O)

SECTION "B"

Q.11 Define the following terms

1) Total derivative
2) Cauchy's rule
3) Vector point function
4) Scalar point function
5) Gradient of a scalar point function
6) Gamma function
7) Integrating factor
8) Relation between Gamma & Beta function
9) Euler's theorem
10) Linear differential equation of the first order
11) Bernoulli's differential equation
12) Maclaurin's Theorem

Q.12 a) Fill in the blanks

1) $\frac{x-y}{\sqrt{x}-\sqrt{y}}$ is a homogeneous function of degree _____
2) $\int_0^1 \int_1^2 dxdy =$ _____
3) The differential equation $y\left(\frac{dy}{dx}\right) = x\left(\frac{dy}{dx}\right)^2 + c$ is of _____ degree
4) If $r = xi + yj + zk$ then $\nabla . r =$ _____
5) $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots =$ _____
6) $\lim_{x\to 0} \frac{\log x}{\cot x}$ assumes the indeterminate form of type _____

b) State true or False

1) $(y\cos x + \sin y + y)\,dx + (\sin x + x\cos y + x)\,dy = 0$ is an exact differential equation .
2) $\lim_{x\to 0} (x)^{1/x}$ assumes the indeterminate form ∞^0 .
3) $\Gamma(n+1) = n!$, provided n is positive integer.
4) If $rt-s^2 > 0$ and $r > 0$ at (a,b) then f (a,b) is minimum at (a,b).
5) $\frac{dy}{dx} + \frac{y}{x} = x^3$ is a linear differential equation.
6) curl grad f = 0.