DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Winter Examination – Dec 2019

Course: B. Tech (All Courses) **Sem: I**

Subject Name: Engineering Mathematics-I **Subject Code: BTMA101**

Max Marks: 60M **Date:-11/12/2019** **Duration:- 3 Hrs.**

Instructions to the Students:

1. All questions are compulsory.
2. Use of non-programmable calculator is allowed.
3. Figures to right indicate full marks.
4. Illustrate your answer with neat sketches, diagram etc. whatever necessary.
5. If some part of parameter is noticed to be missing you may appropriately assume it and should mention it clearly.

		Marks
Q. 1	**Solve the following questions.**	
A)	Reduce to the Normal form and find the rank of the given matrix. $A=\begin{bmatrix}1 & 2 & 3 & -1\\ -1 & -1 & -3 & -1\\ 1 & 0 & 1 & 1\\ 0 & 1 & 1 & -1\end{bmatrix}$	4
B)	Test the consistency and solve: $2x_1+x_2-x_3+3x_4=11$, $x_1-2x_2+x_3+x_4=8$, $4x_1+7x_2+2x_3-x_4=0$, $3x_1+5x_2+4x_3+4x_4=17$	4
C)	Find the eigen value & eigen vector for least positive eigen value of the matrix : $A=\begin{bmatrix} & & - \\ - & & \\ - & & \end{bmatrix}$	4
Q.2	**Solve any *three* of the following.**	
A)	If $x^x y^y z^z = c$ show that at point $x=y=z$, $\frac{\partial^2 z}{\partial x \partial y} = -[x \quad ex]^{-1}$	4
B)	If $u = \left(\frac{x}{y}\right)$ $x=e^t$ $y=t^2$ verify $\frac{du}{dt}=\frac{\partial u}{\partial x}\frac{dx}{dt}+\frac{\partial u}{\partial y}\frac{dy}{dt}$	4
C)	If $u = {}^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ then prove that $x^2\frac{\partial^2 u}{\partial x^2} + \quad xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = - \quad u \quad u \quad {}^3 u \quad -$	4
D)	If $u = f \quad x - \quad y \quad y - \quad z \quad z - \quad x$ prove that $-\frac{\partial u}{\partial x} + -\frac{\partial u}{\partial y} + -\frac{\partial u}{\partial z} =$	4
Q. 3	**Solve any *three* of the following.**	
A)	Expand $f \quad x \quad y = e^{x+y}$ in Maclaurin's theorem up to fourth term.	4
B)	If $x = u \quad - v \quad y = uv$ prove that $JJ' =$	4
C)	A rectangular box open at the top is to have volume of 256 cubic feet, determine the dimensions of the box required least material for the construction of the box.	4
D)	Examine the function $x^3 + y^3 - \quad axy$ for maxima & minima where $a >$	4

Q.4	**Solve any *three* of the following.**	
A)	Evaluate $\int_0^{2a} x\sqrt{(2ax-x^2)}dx$	**4**
B)	Trace the Curve $y^2\ \ a-x\ \ =x^2\ \ a+x$	**4**
C)	Trace the Curve $x\ =\ a\ cos^3 t\ ,\ y\ =\ a\ sin^3 t$	**4**
D)	Trace the Curve $r=a\ \cos 3\theta$	**4**
Q. 5	**Solve the following questions.**	
A)	Change the order of integration $I=\int_0^a\int_x^{a^2/x} f(x,y)dxdy$	**4**
B)	Change to polar and evaluate $\int_0^a\int_{\sqrt{ax-x^2}}^{\sqrt{a^2-x^2}} \frac{dxdy}{\sqrt{a^2-x^2-y^2}}$	**4**
C)	Find the volume bounded by the cylinders $x^2+y^2=ax\ \&\ z^2=ax$	**4**
	END	