SVKM INSTITUTE OF TECHNOLOGY, DHULE

Mid Semester Exam 2019-20

Course: Common to All Branches **Div: A/B/C/D/E** **Sem: I**

Subject Name: Engineering Mathematics I **Subject Code: BTBS101**

Max Marks: 20 **Date:-3/10/2019** **Duration:- 1 Hr.**

Instructions to the Students:

1. All Questions are Compulsory
2. Use of Non-Programmable calculator allowed

(Level/CO) Marks

Q.1 Write a correct option of following questions **6**

1. The Product of Eigen values of Matrix A equal to — **Understand**
(a) |A| (b) 0 (c) 1 (d) None

2. Eigen values of triangular matrix are — **Understand**
(a) Non Principle diagonal (b) Principle Diagonal (c) Zero (d) None

3. The Eigen values of A and A' are always — **Understand**
(a) Different (b) Same (c) Cannot be decided (d) None

4. If $z = e^{xy}$ then $\frac{\partial z}{\partial y} = \cdots \dots\dots$ — **Apply**

$(a) e^{xy}$ (b) $e^{xy}\, y$ (c) $e^{xy}\, x$ (d) $e^{xy}\, xy$

5. If $u = x^y$ then $\frac{\partial u}{\partial x} = \dots$ — **Apply**

(a) $x^y logx$ (b) $x^y logy$ (c) yx^{y-1} (d) 0

6. If $u = x^2 + 2xy + y^2$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \cdots$ — **Apply**
(a) u (b) 0 (c) 3u (d) 2u

Q.2 Solve Any Two of the following. **3 X 2**

(A) Reduce the Matrix A to Normal form and find its Rank $A = \begin{bmatrix} 1 & -1 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 1 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$ — **Apply**

(B) If $u = f(x - y, y - z, z - x)$ then show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$ — **Evaluate**

(C) Prove that $\frac{\partial f}{\partial y} \cdot \frac{\partial \phi}{\partial z} \cdot \frac{dz}{dx} = \frac{\partial f}{\partial x} \cdot \frac{\partial \phi}{\partial y}$ if $f(x, y) = 0$ *and* $\phi(y, z) = 0$ — **Understand**

Q.3 Solve Any One of the following. **8**

(A) Verify Cayley-Hamilton theorem to $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ and hence find A^{-1} also deduce that $A^8 = 625I$ — **Apply/ Evaluate**

(B) If $u = \operatorname{cosec}^{-1}\sqrt{\frac{x^{\frac{1}{2}}+y^{\frac{1}{2}}}{x^{\frac{1}{3}}+y^{\frac{1}{3}}}}$ prove that — **Apply /Evaluate**

$$x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \frac{\tan u}{12}\left[\frac{13}{12} + \frac{1}{12}\tan^2 u\right]$$