

**DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) /
DIPLOMA IN MECHANICAL ENGINEERING
(DME) / DCLEVI / DMEVI / DELVI / DECVI /
DCSVI / ACCLEVI / ACMEVI / ACELVI /
ACECVI / ACCSVI**

00652

Term-End Examination

June, 2019

BET-021 : MATHEMATICS – II

Time : 2 hours

Maximum Marks : 70

Note : *Question no. 1 is compulsory. Attempt any four questions out of the remaining. Use of scientific calculator is permitted.*

1. Answer any seven out of the following : $7 \times 2 = 14$

(a) Evaluate AB where $A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 1 & 0 \end{bmatrix}$ and

$B = \begin{bmatrix} 1 & 2 \\ 2 & 0 \\ -1 & 1 \end{bmatrix}$; also find $(AB)^T$.

(b) If $y = e^{mx}$, then find $\frac{d^2y}{dx^2}$.

(c) Evaluate :

$$\int \frac{\sin^2 x}{\cos^4 x} dx$$

(d) If $Q_3 = 25.75$ and $Q_1 = 17.71$, then find Quartile Deviation.

(e) Find the mean and standard deviation of the following numbers :

1, 2, 3, 4, 5, 6, 7

(f) Find $|z|$ where $z = \frac{5-i}{2-3i}$

(g) Evaluate :

$$\int \sec^4 x dx$$

(h) Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sin^{-1} x}{x}$$

(i) Find the equation of the normal to the parabola $y^2 = 4ax$ at $(0, 0)$.

(j) A function $f(x)$ is defined as

$$\begin{aligned} f(x) &= x^2 && \text{when } x < 1 \\ &= 2.5 && \text{when } x = 1 \\ &= x^2 + 2 && \text{when } x > 1 \end{aligned}$$

Examine if $\lim_{x \rightarrow 1} f(x)$ exists.

2. (a) Using matrices A, B and C

$$A = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & 1 \end{bmatrix}; B = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 1 & 1 & 1 \end{bmatrix};$$
$$C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix},$$

verify the rule : $(AB)C = A(BC)$.

(b) Evaluate the following determinant :

$$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$$

$$2 \times 7 = 14$$

3. (a) The function $f(x) = \frac{x^2 - 16}{x - 4}$ is undefined at

$x = 4$. What value must be assigned to $f(x)$

so as to be continuous at $x = 4$?

(b) Evaluate : $\lim_{x \rightarrow 3} \frac{3 - \sqrt{6+x}}{\sqrt{3} - \sqrt{6-x}}$ 7+7=14

4. (a) Find $\frac{dy}{dx}$, where $y = 2x^4 - \frac{4}{\sqrt[4]{x^3}} + \frac{3x^2}{\sqrt[3]{x}} - 5$.

(b) Find $\frac{dy}{dx}$, where $y = \frac{1}{1 + x^{b-a} + x^{c-a}} + \frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{a-c} + x^{b-c}}$.

(c) If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$, then prove that

$$2x \cdot \frac{dy}{dx} + y = 2\sqrt{x} . \quad 5+4+5=14$$

5. (a) Evaluate :

$$\int \sqrt{1-x^2} \, dx$$

(b) Evaluate the integral :

$$\int_0^2 \frac{\sqrt{x} \, dx}{\sqrt{x} + \sqrt{2-x}} \quad 2 \times 7 = 14$$

6. (a) Compute the arithmetic mean and median of the following data :

Income (₹ '000)	No. of Persons
Under 1	13
1 - 2	90
2 - 3	81
3 - 5	117
5 - 10	66
10 - 25	27
25 - 50	6
50 - 100	2
100 - 1000	2

- (b) Calculate the mean and standard deviation of the following data :

Grades	Frequency
30 - 39	2
40 - 49	3
50 - 59	11
60 - 69	20
70 - 79	32
80 - 89	25
90 - 99	7

$$2 \times 7 = 14$$

7. (a) Find the area enclosed between the curve $y^2 = x^2(4 - x^2)$, the co-ordinate axes and the ordinate $x = 2$.
- (b) A particle moving in a straight line has a velocity v cm/sec at time t sec where $v = 5 - 4t + 3t^2$. Find its displacement at 3 sec and the acceleration at that time.

$2 \times 7 = 14$
