

Diploma in Civil Engineering (DCLE(G))
Diploma in Mechanical Engineering (DME)
DCLEVI/DMEVI/DELVI/DECVI/DCSVI/
ACCLEVI/ACMEVI/ACELVI/ACECVI/ACCSVI

Term-End Examination

December, 2012

03060

BET-021 : MATHEMATICS-II

Time : 2 hours

Maximum Marks : 70

Note : Question No. 1 is compulsory. Attempt any four questions out of the remaining questions no. 2 to 7. Use of calculator is permitted.

1. (a) Select the correct answer : 7x1=7

(i) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1}$ is equal to :

(A) 1 (B) 2

(C) 3 (D) 0

(ii) If $f(x) = x^n$ and $f'(1) = 10$ then value of n is :

(A) 1 (B) 0

(C) 10 (D) None of these

(iii) $\int x^{1/2} dx$ is equal to :

(A) $\frac{2}{3}x^{3/2} + C$

(B) $\frac{2}{3}x^{2/3} + C$

(C) $x^{3/2} + C$

(D) $\frac{1}{2}x^{3/2} + C$

(iv) $\int_4^5 e^{-x} dx$ is equal to :

(A) $e^{-5} - e^{-4}$ (B) $e^{-4} - e^{-5}$

(C) $e^5 - e^4$ (D) $e^4 - e^5$

(v) $1 + i^2 + i^4 + i^6 + \dots + i^{2n}$ is :

(A) Positive

(B) Negative

(C) 0

(D) Cannot be determined.

(vi) If $X + Y = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$ and

$X - Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$ then X is equal to :

(A) $\begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}$ (B) $\begin{bmatrix} 5 & 1 \\ 0 & 4 \end{bmatrix}$

(C) $\begin{bmatrix} 5 & 0 \\ 1 & 4 \end{bmatrix}$ (D) $\begin{bmatrix} 5 & 4 \\ 1 & 0 \end{bmatrix}$

(vii) $\left| \frac{3 + 2i}{3 - (1 - i)^2} \right|$ is equal to :

(A) 5 (B) $1 + i$

(C) $1 - i$ (D) 1

(b) Fill in the blanks :

7x1=7

(i) Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then $A - A'$ is equal

to _____.

(ii) $\lim_{2x \rightarrow 0} \frac{e^{2x} - 1}{3x}$ is equal

to _____.

(iii) $(1+i)^5 \left(1 + \frac{1}{i}\right)^5 = \underline{\hspace{2cm}}$.

(iv) $\int \left(x + \frac{1}{x}\right) dx = \underline{\hspace{2cm}}$.

(v) A particle moves in a line at $t=2.25$ seconds so that $s = \sin \frac{t}{9}$. If its position S is in meters and time t is in seconds then velocity is $\underline{\hspace{2cm}}$.

(vi) The median of 2,3,3,4,6,7, is $\underline{\hspace{2cm}}$.

(vii) The absolute minimum value of $x^4 - x^2 - 2x + 5$ is $\underline{\hspace{2cm}}$.

2. (a) Differentiate $\frac{1}{ax^2 + bx + c}$ with respect to x . 7+7

to x .

(b) Find the maximum and minimum values of $f(x) = x^3 - 12x^2 + 36x + 17$ in $1 \leq x \leq 10$.

3. (a) Evaluate $\int x^3 \log 2x \, dx$. 7+7

(b) Evaluate $\int_{-\pi/2}^{\pi/2} (\cos x + x^5 \sin^4 x) \, dx$.

4. (a) If $x + iy = \sqrt{\frac{a + ib}{c + id}}$, prove that 7+7

$$(x^2 + y^2)^2 = \frac{a^2 + b^2}{c^2 + d^2}$$

(b) If $Z^r = \cos\left(\frac{\pi}{3^r}\right) + i \sin\left(\frac{\pi}{3^r}\right)$.

$r=1,2,3 \dots$ then prove that $z_1, z_2, z_3, \dots = i$

5. (a) Show that the function : 7+7

$$f(x) = \begin{cases} x \sin \frac{1}{x}, & \text{when } x \neq 0 \\ 0, & \text{when } x = 0 \end{cases}$$

is continuous at $x=0$.

(b) Solve the system of equations :

$$6x + y - 3z = 5$$

$$x + 3y - 2z = 5$$

$$2x + y + 4z = 8$$

6. (a) Find the mean and standard deviation of 7+7 the following data :

Classes	Frequency
120 - 130	2
130 - 140	5
140 - 150	25
150 - 160	10
160 - 170	8

- (b) Find the median of the following data :
12 , 18, 16, 21, 10, 13, 17, 19

7. (a) Find the inverse of the matrix : $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ 7+7

- (b) Evaluate the determinant of :

$$\begin{bmatrix} x + y & y + 3 & 3 + x \\ 3 & x & y \\ 1 & 1 & 1 \end{bmatrix}$$
