

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

**Term-End Examination**

**June, 2013**

**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 : 1x7=7

(i) The cofactor  $A_{23}$  of the matrix

$$A = \begin{bmatrix} 5 & -2 & 7 \\ 6 & 1 & -9 \\ 4 & -3 & 8 \end{bmatrix} \text{ is :}$$

(A) -23                      (B) 23

(C) -7                        (D) 7

(ii)  $\lim_{x \rightarrow 0} \frac{\sin^2 x}{2x}$  is equal to :

(A) 1                         (B) 2

(C)  $\frac{1}{2}$                         (D) 0

(iii)  $\frac{e^x + e^{-x}}{2}$  is equal to :

- (A)  $\sinh x$       (B)  $\cosh x$   
(C)  $\sin x$       (D)  $\cos x$

(iv) The range of the function

$f(x) = \frac{1 + x^2}{x^2}$  is equal to :

- (A)  $[0, 1]$       (B)  $(0, 1)$   
(C)  $(1, \infty)$       (D)  $[1, \infty]$

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

- (A)  $-\frac{1}{x} + C$   
(B)  $-\frac{1}{x}$   
(C)  $-\frac{1}{x^3} + C$   
(D)  $-\frac{1}{x^3}$

(vi)  $\int_0^1 2^x dx$  is equal to :

- (A)  $\log 2$       (B)  $\frac{1}{\log 2}$   
(C)  $\frac{2}{\log 2}$       (D)  $2 \log 2$

(vii)  $[-1\sqrt{(-1)}]^{(4n+3)}$  is equal to :

- (A)  $i$       (B)  $-1$   
(C)  $1$       (D) None of these

(b) Fill in the blanks :

1x7=7

(i) If  $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$  then  
Adj A = \_\_\_\_\_.

(ii) Vertices of triangle are (0, 0), (6, 0) and (4, 3) then the area of the triangle is \_\_\_\_\_.

(iii)  $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x - 2} =$  \_\_\_\_\_.

(iv)  $\cos(\sin x)$  is continuous at \_\_\_\_\_.

(v)  $\frac{d}{dx} (\tan \sqrt{x}) =$  \_\_\_\_\_.

(vi)  $\int \frac{\sec^2 x dx}{\sqrt{1 - \tan^2 x}} =$  \_\_\_\_\_.

(vii) Standard deviation of 10, 10, 10, 10, 10 = \_\_\_\_\_.

2. (a) Evaluate :  $\int \cos^3(ax + b)\sin(ax + b)dx$  7+7

(b) Evaluate :  $\int_0^a \frac{x^2}{\sqrt{a^2 - x^2}} dx$

3. (a) Solve  $(x + iy)(2 - 3i) = 4 + i$ , where  $x$  and  $y$  are real. 7+7

(b) If  $n$  is a positive integer, prove that

$$(1 + i)^n + (1 - i)^n = 2^{\frac{n+2}{2}} \cos \frac{n\pi}{4}$$

4. (a) Solve the system of equations : 7+7  
 $2x - 2y - z = 3$   
 $4x + 5y - 2z = -3$   
 $3x + 4y - 3z = -7$

(b) If  $A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & 1 & 3 \\ 0 & -2 & 1 \end{bmatrix}$ , find  $A^{-1}$ .

5. (a) Differentiate  $\frac{e^x + 1}{e^x - 1}$  with respect to  $x$ . 7+7  
 (b) At time  $t$ , the distance  $x$  of a particle moving in a straight line is given by  $x = 4t^2 + 2t$ . Find the velocity and acceleration when  $t = \frac{1}{2}$ .

6. (a) Show that : 7+7  

$$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = (b - c)(c - a)(a - b)$$

(b) Evaluate :  $\lim_{x \rightarrow 0} \frac{1 - \cos mx}{1 - \cos nx}$

7. (a) Find the mean deviation from median for 7+7  
 the data :

Marks :	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of students :	5	8	15	16	6

- (b) Calculate median and mode for the following data :

Height (cm) :	120	121	122	123	124	125
No. of students :	8	12	17	14	13	6