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BET-021

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

01231 **Term-End Examination**

June, 2015

BET-021 : MATHEMATICS – II

Time : 2 hours *Maximum Marks : 70*

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

1. Answer any ***seven*** parts of the following : *7×2=14*

(a) Express $-1+\sqrt{-3}$ in the form $r(\cos\theta + i\sin\theta)$.

(b) Find $\lim_{x\to 0} \frac{1-\cos x}{x}$.

(c) $\int \sec x(\sec x + \tan x)\,dx$

(d) $\int_{-2}^{2} (ax^3 + bx + c)\,dx$

(e) If $y = \sin x^2$, find $\frac{dy}{dx}$.

(f) A particle is moving along a straight line according to the formula $s = 12t - 3t^2$, where s is in metres and t is in seconds. Find its velocity and acceleration.

(g) If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$,

then evaluate $A^2 + B^2$.

(h) The marks obtained by ten students out of 20 marks in a test were

13, 17, 11, 5, 18, 16, 11, 19, 17, 6.

Find the mean value of the marks.

(i) Evaluate $\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix}$, where ω is the cube root of unity.

(j) Show that sin x is strictly increasing in the interval $\left(0, \frac{\pi}{2}\right)$ and strictly decreasing in the interval $\left(\frac{\pi}{2}, \pi\right)$.

2. (a) If $y = \tan^{-1}\left(\sqrt{1+x^2} - x\right)$, find $\frac{dy}{dx}$.

(b) Examine the differentiability of the function

$$f(x) = \begin{cases} x, & -\infty < x < 0 \\ 1, & 0 \le x < 2 \\ 3-x, & 2 \le x. \end{cases}$$

2×7=14

3. (a) Check whether the mean value theorem is applicable to the function $y = 1 - x^{1/3}$ over the interval $[-1, 1]$.

(b) Evaluate :

$$\int \frac{dx}{4+5\cos x}$$

2×7=14

4. (a) Evaluate $\int_a^b x^2\, dx$ as the limit of sums.

(b) If n is a positive integer prove that $\left(\sqrt{3}+i\right)^n + \left(\sqrt{3}-i\right)^n = 2^{n+1}\cos\frac{n\pi}{6}$. *2×7=14*

5. (a) Show that if two rows or columns of a determinant are identical, then the value of the determinant is zero.

(b) Find the adjoint of the matrix

$$\begin{bmatrix} 4 & -6 & 1 \\ -1 & -1 & 1 \\ -4 & 11 & -1 \end{bmatrix}.$$

2×7=14

6. (a) Find the SD of the following :

x_i	f_i
140	4
145	6
150	15
155	30
160	36
165	24
170	8
175	2

(b) Calculate the mean and median of the following data :

Number of workers	Wages/week
12	15
30	30
65	45
107	60
157	75
202	90
222	105
230	120

2×7=14

7. (a) Determine the greatest and least value of the function

$$f(x) = x^5 - 5x^4 + 5x^3 - 1$$

in the interval [0, 2].

(b) Find

$$\lim_{x \to 0} \frac{x^2}{\sec x - 1}.$$

2×7=14