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BET-021

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, 2018

00373

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*** parts of the following : *7×2=14*

(a) Show that the function

$$x \cdot \frac{3^x - 1}{3^x + 1} \text{ is even.}$$

(b) Evaluate :

$$\lim_{x \to 0} \frac{\log (1 + \alpha x)}{e^{2x} - 1}$$

(c) A function $\phi(x)$ is defined as follows :

$$\phi(x) = \frac{\tan 3x}{4x}, \text{ when } x \neq 0$$

$$= \frac{4}{3}, \text{ when } x = 0$$

Examine the continuity of $\phi(x)$ at $x = 0$.

(d) Find the derivative of $\tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$.

(e) Evaluate :

$$\int \frac{\sqrt{\tan x}}{\sin 2x}\, dx$$

(f) Find the conjugate of $\frac{x+iy}{x-iy}$ (x, y are real).

(g) Evaluate :

$$\int_1^e \frac{dx}{x(1+\log x)^2}$$

(h) Find the matrices A and B for which :

$$A + B = \begin{bmatrix} 1 & 5 & 10 \\ 5 & 9 & 8 \end{bmatrix} \text{ and}$$

$$A - B = \begin{bmatrix} -1 & -1 & -4 \\ 1 & 1 & 6 \end{bmatrix}$$

(i) A particle is moving in a straight line and its distance S cm from a fixed point in the line after t seconds is given by, $S = 12t - 15t^2 + 4t^3$. Find the velocity and acceleration of the particle after 3 seconds.

(j) The index numbers of 4 commodities were 92, 125, 180 and 80, and the weights 12, 7, 6 and 9 are assigned to these commodities. Find the combined arithmetic average index number.

2. (a) Given that $y = (3x + 1)^2 + (2x - 1)^3$, find dy/dx and the points on the curve for which $dy/dx = 0$.

(b) Evaluate :

$$\lim_{x \to 0} \frac{\sqrt[3]{1+x} - \sqrt[3]{1-x}}{x}$$

7+7=14

3. (a) If $y = \sqrt{3x} - \sqrt{3/x} + \frac{x+6}{6-x}$, find the value of $\left[\frac{dy}{dx}\right]_{x=3}$.

(b) Find the area included between $y^2 = 9x$ and $y = x$.

7+7=14

4. (a) Verify Rolle's theorem for the function $f(x) = x(x-3)^2$ in the interval $[0, 3]$.

(b) Evaluate :

$$\int \log\left(x + \sqrt{x^2 + a^2}\right) dx$$

7+7=14

5. (a) Evaluate :

$$\int_1^2 5x^2\,dx$$

as the limit of sums.

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

$$\left(\frac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right)^n = (\sin\theta + i\cos\theta)^n$$

$$= \cos\left(\frac{n\pi}{2}-n\theta\right) + i\sin\left(\frac{n\pi}{2}-n\theta\right). \quad 7+7=14$$

6. (a) Show that :

$$\begin{vmatrix} b+c & a+b & a \\ c+a & b+c & b \\ a+b & c+a & c \end{vmatrix} = a^3+b^3+c^3-3abc$$

(b) Compute A^{-1} for the matrix

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}.$$

Hence solve the system of equations

$y + 2z + 8 = 0$, $x + 2y + 3z + 14 = 0$, 7
$3x + y + z + 8 = 0$. *7+7=14*

7. (a) The following is the frequency table showing the heights of 200 boys :

Heights (inches)	*No. of Students*
53	7
55	14
57	31
59	60
61	52
63	29
65	4
67	3

Calculate Mean and Standard deviation.

(b) Calculate the Mean Deviation of the following values about the median :

8, 15, 53, 49, 19, 62, 7, 15, 95, 77. *7+7=14*