No. of Printed Pages : 6

BET-021

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

00803

Term-End Examination

December, 2018

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) If $A = \begin{bmatrix} 0 & 2 & 3 \\ 2 & 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 6 & 3 \\ 1 & 4 & 5 \end{bmatrix}$, find the value of $2A + 3B$.

(b) Evaluate :

$$\int \frac{e^x(1+x)\,dx}{\cos^2(xe^x)}$$

(c) Show that the function $y = x^3 - 3x^2 + 15$ has a maximum value at $x = 0$.

(d) If $\Sigma X^2 = 285$; $\Sigma X = 45$; and $n = 9$, then find standard deviation.

(e) Find the mean, median and mode of the following observations :

1, 2, 3, 1, 2, 2, 4, 5, 2, 1, 2, 5.

(f) Find the following complex number in the form of a + ib and hence find its modulus :

$$\frac{1+i}{1-i}$$

(g) Evaluate :

$$\int_0^{\pi/4} \tan^2 x \, dx$$

(h) Evaluate :

$$\lim_{x \to 0} \frac{\tan x}{x}$$

(i) A function is defined as follows :

$$f(x) = 3 + 2x, \text{ when } -\frac{3}{2} < x \leq 0$$

$$= 3 - 2x, \text{ when } 0 < x < \frac{3}{2}$$

Show that f(x) is continuous at $x = 0$.

(j) Find the equation of tangent to the parabola $y^2 = x$ at a point where abscissa is double of its ordinate.

2. (a) Find A^{-1} when

$$A = \begin{bmatrix} 3 & -10 & -1 \\ -2 & 8 & 2 \\ 2 & -4 & -2 \end{bmatrix}.$$

(b) Show that :

$$\begin{vmatrix} a & b-c & c-b \\ a-c & b & c-a \\ a-b & b-a & c \end{vmatrix}$$

$$= (a+b-c)(b+c-a)(c+a-b) \qquad 2\times7=14$$

3. (a) Discuss the continuity of the following function at $x = 2$:

$$f(x) = x^2 + 2, \quad 0 \le x \le 2$$
$$= x + 4, \quad 2 \le x \le 3$$
$$= 8, \quad x = 2$$

(b) Evaluate :

$$\lim_{x \to 0} \frac{\tan 2x - 2\sin x}{x^3}$$

(c) Verify Rolle's theorem for the function

$$f(x) = x^2 - 4x + 3$$

in the interval $1 \le x \le 3$. *4+5+5=14*

4. (a) Given that,

$$y = 2x^3 - 15x^2 + 36x + 8.$$

For what value of x, $\frac{dy}{dx}$ will be zero.

(b) If $y = \frac{x}{x+4}$, then show that

$$x \cdot \frac{dy}{dx} + y(y-1) = 0.$$

(c) If $y = \sqrt{\frac{x}{a}} - \sqrt{\frac{a}{x}}$, then show that

$$2xy \cdot \frac{dy}{dx} = \frac{x}{a} - \frac{a}{x}.$$ *4+5+5=14*

5. (a) Evaluate the following integrals :

$$\int e^x . \cos x \, dx$$

(b) Evaluate :

$$\int_0^{\pi/4} \sin 2x \, . \sin 3x \, dx$$ *2×7=14*

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

Class Limits	*Frequency*
130 – 134	5
135 – 139	15
140 – 144	28
145 – 149	24
150 – 154	17
155 – 159	10
160 – 164	1

(b) Find the mean and the standard deviation from the following distribution : *2×7=14*

Class Limits	*Frequency*
131 – 140	2
141 – 150	5
151 – 160	4
161 – 170	9
171 – 180	7
181 – 190	5
191 – 210	3
211 – 240	1

7. (a) Find the equation of the tangent to the curve

$$\frac{x^2}{9} + \frac{y^2}{4} = 2 \text{ at } (3, 2).$$

(b) Show that for all values of n the equation of the tangent of (a, b) on the curve

$$\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2 \text{ is } \frac{x}{a} + \frac{y}{b} = 2.$$

2×7=14
