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No. of Printed Pages : **4**

BET-021

Diploma in Civil Engineering / Diploma in Electrical and Mechanical Engineering
DCLEVI/DMEVI/DELVI/DECVI/DCSVI/ ACCLEVI/ACMEVI/ACELVI/ACECVI/ACCSVI

Term-End Examination

June, 2012

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. Use of calculator is **permitted**.*

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1. (a) If $A = \begin{pmatrix} 2 & -2 \\ -3 & 1 \end{pmatrix}$ **7x2=14**

Find $A+I$ where I is a unit matric of order 2.

(b) A particle moves along a straight line. At any time t, the distance S travelled by the particle is given by $S=32t^2+9$. Find the velocity at the time $t=2$

(c) The parametric equation of a function is $x=a \cos t$, $y=a \sin t$, $0 \leq + \leq \pi$

Find $\frac{dy}{dx}$ at $t = \frac{\pi}{4}$.

(d) Evaluate $\int \frac{dx}{(x+2)^4}$.

(e) $\int_0^{\frac{\pi}{4}} \text{Sec}^2 x \, dx$

(f) Find the modulus and principal argument of $\sqrt{3} + i$

(g) Prove that $f(x) = x^2$ is a strictly decreasing function in $I = (-\propto, o)$

(h) Find the equation of the normal line to the curve $x^2 + y^2 = 16$ at the point P(4, 0)

(i) Can Rolle's theorem be applied to the function $f(x) = x^2 + 4$ on $[-2, 2]$
Find 'C' in case it can be applied.

(j) The number of hours spent by a School boy on different activities in a working day is given below, present this information in the form of a Pie Chart.

Activity	# of hours spent
Sleep	8
School	8
Home work	6
Other	2
Total	24

2. (a) Using properties of determinants, prove that **2x7=14**

$$\begin{bmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{bmatrix} = (5x+4)(4-x)^3$$

(b) Let $A = \begin{pmatrix} 3 & 2 \\ 7 & 5 \end{pmatrix}$, $B = \begin{pmatrix} 6 & 7 \\ 8 & 9 \end{pmatrix}$ Find $(AB)^{-1}$

3. (a) Show that $\lim_{x \to 2} \frac{|x-2|}{x-2}$ does not exist. **2x7=14**

(b) If $f(x) = \begin{cases} \frac{\text{Sin } 2x}{\text{Sin } 3x}, & x \neq 0 \\ 2 & , x = 0 \end{cases}$

Find whether the function $f(x)$ is continuous at $x=0$

4. (a) Find $\frac{dy}{dx}$, if $x^2+y^2+2y=15$ **5+4+5=14**

(b) Find $\frac{dy}{dx}$ if $y=x^{\text{Sin}^{-1}x}$

(c) Express $\frac{1+2i}{1-3i}$ in the form r $(\cos\theta + i \sin\theta)$

5. (a) Evaluate $I_1 = \int \frac{2x+5}{x^2-x-2}\, dx$ **2x7=14**

(b) and $I_2 = \int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\, dx$

6. The following table gives the weekly **2x7=14**

(a) consumption of electricity of 50 families. Find the mean and median weekly consumption :

Weekly consumption	0-10	10-20	20-30	30-40	40-50
# of Families	6	12	18	3	1

(b) The marks obtained by 20 students in a test were 13, 17, 11, 5, 18, 16, 11, 14, 13, 12, 18, 11, 9, 6, 8, 17, 21, 22, 7, 6,
find the mean marks per student and the mean marks per student when the marks of each student are doubled.

7. (a) The function $f(x) = x^4 - 62x^2 + ax + 9$ attains a maximum value on the interval $[0, 2]$. Find the value of a. **2x7=14**

(b) Find the intervals in which the function $f(x) = 2x^3 + 9x^2 + 12x + 20$ is increasing or decreasing.