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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

December, 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. Use of scientific calculator is **permitted**.*

1. Attempt **any seven** out of the parts given in Q. No. **1** : **2x7=14**

(a) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 5 \end{bmatrix}, B = \begin{bmatrix} 2 & -1 & 1 \\ 3 & 5 & -2 \end{bmatrix}$

Find $(A+B)^T$

(b) If $y = \log(\cos x)$, find $\frac{dy}{dx}$

(c) Find $\frac{dy}{dx}$ if $y = \sin^{-1}\frac{2x}{1+x^2}$

(d) Find the value of $\int x\sec^2 x\, dx$

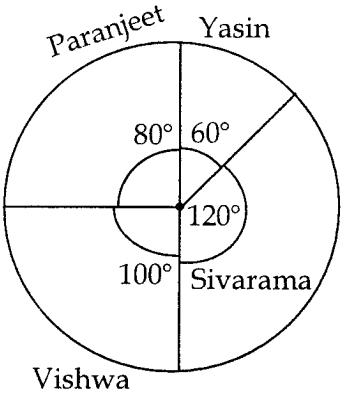
(e) Find the value of $\int_1^2 \frac{dx}{x(1+\log x)}$

(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 the acceleration at any time t.

(g) Show that the function $f(x) = x^2$ is a decreasing function in $]-\infty, 0]$

(h) Find the equation of the tangent to the curve $y = x^2 + 4x + 1$ at the point where $x = 3$.

(i) The following Pie chart represents the number of valid votes obtained by four students who contested for school leadership. The total number of valid votes polled was 720. What is the minimum number of votes obtained by any candidate ?



(j) Find the principal argument of the complex number $-\sqrt{3} - i$

2. (a) Show that **2x7=14**

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

(b) Compute the inverse of the matrix

$$A = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 5 \end{bmatrix}$$

3. (a) Evaluate : **2x7=14**

$$\lim_{x \to 3} \frac{x^2-4x+3}{2x^2-11x+15}$$

(b) The function f is defined by

$$f(x) = \begin{cases} 5x - 4 & 0<x\leq 1 \\ 4x^3 - 3x & 1<x<2 \end{cases}$$

Examine whether or not f(x) is continuous at $x=1$

4. (a) If $x^y = e^{x-y}$, prove that : **4, 5, 5**

$$\frac{dy}{dx} = \frac{\log_e^x}{\left(1 + \log_e^x\right)^2}$$

(b) If $y = \tan^{-1}(\sec x + \tan x)$, find $\frac{dy}{dx}$

(c) If n is a positive integer, prove that :

$$\left(\sqrt{3}+i\right)^n + \left(\sqrt{3}-i\right)^n = 2^{n+1}\cos\frac{n\pi}{6}$$

5. Evaluate each of the following : **2x7=14**

(a) $I = \tan^{-1}\left(\frac{2x}{1-x^2}\right)dx$

(b) $I = \int_2^8 |x-5|dx$

6. (a) Find the intervals in which the functions $f(x) = 7 + 12x - 3x^2 - 2x^3$ is increasing or decreasing. **5, 4, 5**

(b) Find two positive number such that their sum is 10 and their product is maximum.

(c) Find the point on the curve $y^3 = x^2(2-x)$ where the tangent is parallel to the x-axis.

7. (a) Calculate the standard deviation for the following distribution : **2x7=14**

x :	8	11	17	20	25	30	35
f :	2	3	4	1	5	7	3

(b) The number of students absent in a school was recorded everyday for 147 days and the frequency table is given below :

# of students absent :	5	6	7	8	9	10	11	12	13	15	18	20
# of days :	1	5	11	14	16	13	10	70	4	1	1	1

Find the median.