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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

Term-End Examination

0225

December, 2014

BET-021 : MATHEMATICS – II

Time : 2 hours *Maximum Marks : 70*

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

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

(a) If $y = \sin x \sin 2x \sin 3x$, find $\frac{dy}{dx}$.

(b) Prove that the function $f(x) = 5x + 3$ is an increasing function.

(c) Express $\frac{(\cos\theta + i \sin\theta)^8}{(\sin\theta + i \cos\theta)^4}$ in the form $x + iy$.

(d) If $A = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$, then show that $A^2 = B^2$.

(e) Find the median of

3, 5, 8, 9, 12, 15, 16, 18, 19, 23.

(f) Find the modulus of the complex number

$$\frac{1-2i}{1-(1-i)^2}.$$

(g) Evaluate

$$\int \sin^3 x \cos x \, dx$$

(h) Evaluate

$$\int_{-1}^{1} (x + x^3 + \sin x) \, dx$$

(i) Find the value $\lim_{x \to 4} \frac{x^2 - 16}{x - 4}$.

(j) For the function $f : x \to x^2$, $\forall x \in R$ and $g : x \to 8x + 1$ for all $x \in R$, find gof (x).

2. (a) Find $\frac{dy}{dx}$, if $y = \frac{\cos x}{x^2}$. 7

(b) Show the ellipse $\frac{x^2}{18} + \frac{y^2}{8} = 1$ and the parabola $x^2 - y^2 = 5$ cut orthogonally. 7

3. (a) Find two positive numbers such that their sum is 10 and their product is as large as possible. 7

(b) Evaluate 7

$$\int \frac{6x^3 - 11x^2 + 5x - 4}{x^4 - 2x^3 + x^2 - 2x}\, dx$$

4. (a) Find the area of the region bounded by the parabola $y = x^2 + 2$ and the lines $y = x$, $x = 0$ and $x = 3$. 7

(b) Use De Moivre's theorem to solve the equation $x^3 + 1 = 0$. 7

5. (a) Evaluate the determinant 7

$$\begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix}$$

(b) Find the matrix X, so that 7

$$X \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}$$

6. (a) The ages of all male inhabitants of a village were received and the following frequency distribution was obtained :

Age (years)	No. of persons
0 – 5	12
5 – 10	18
10 – 20	16
20 – 30	19
30 – 40	14
40 – 50	11
50 – 60	4
60 – 80	3

Obtain the mean age per male inhabitant. 7

(b) The scores of a batsman in 10 different matches were 38, 70, 48, 34, 42, 55, 63, 46, 54, 44. Find the MD and SD of these scores. 7

7. (a) Draw the graph of the curve $y = \sin^2 x$. 7

(b) Find the equation of the tangent and normal to the parabola $y^2 = 4ax$ at the point (x_1, y_1). 7