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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

00542

Term-End Examination

December, 2016

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 no. 2 to 7. Use of calculator is permitted.*

1. (A) Select the correct answer from the four alternatives. *7×1=7*

(i) $\lim_{x \to 0} \frac{x^3 + 2x^2 + x}{x^2 + 2x}$ is equal to

(a) $\frac{1}{2}$

(b) 0

(c) 2

(d) 1

(ii) If $x = a \cos t$, $y = a \sin t$ $(0 \leq t \leq \pi)$, then the value of $\frac{dy}{dx}$ at $t = \frac{\pi}{4}$ is

(a) 1

(b) -1

(c) 0

(d) ∞

(iii) $\int x^{-1}\, dx$ is equal to

(a) $\log x + c$

(b) $e^x + c$

(c) $\frac{x^{-2}}{2} + c$

(d) None of these

(iv) $\int_{-2}^{2} x^3\, dx$ is equal to

(a) 4

(b) -4

(c) 0

(d) 8

(v) If $a + ib = \frac{(1+i)(2+i)}{3+i}$, then

(a) $a = \frac{4}{5}, \ b = \frac{3}{5}$

(b) $a = \frac{4}{5}, \ b = \frac{-3}{5}$

(c) $a = \frac{-4}{5}, \ b = \frac{3}{5}$

(d) $a = \frac{3}{5}, \ b = \frac{4}{5}$

(vi) If A and B are square matrices of the same order, then

det AB = det A . det B.

(a) False

(b) True

(c) Sometimes True

(d) None of these

(vii) According to De Moivre's theorem,

$(\cos \theta + i \sin \theta)^n = \cos n\theta + i \sin n\theta$ is true

(a) if n is a positive integer

(b) if n is a negative integer

(c) if n is an integer

(d) if n depends upon the value of θ

(B) Fill in the blanks : $7 \times 1 = 7$

(i) Let $A = [a_{ij}]_{2\times 2}$ and $a_{ij} = i + j$, then A^2 is equal to _____ .

(ii) $\lim\limits_{x \to 0} \dfrac{x^n - a^n}{x - a}$ is equal to _____ .

(iii) If $(1 + i) = r(\cos\theta + i \sin\theta)$, then r is _____ and θ is _____ .

(iv) $\int \log x \, dx =$ _____ .

(v) A particle moves along a straight line according to the formula $s = 12t - 3t^2$, where s is in meter and t is in seconds. Its acceleration is _____ .

(vi) The central value of a set of observations is called _____ .

(vii) Points of maxima and minima for the function
$f(x) = x^5 - 5x^4 + 5x^3 - 1$ are _____ .

2. (a) Differentiate $(\sin x)^{\cos x}$ with respect to x.

(b) Find the angle between the curves
$f(x) = 4 - x^2$ and $g(x) = x^2$. 7+7

3. (a) Evaluate :

$$\int x \tan^{-1} x \, dx$$

(b) Evaluate :

$$\int_0^1 \frac{x \, dx}{\sqrt{1+x^2}}$$

7+7

4. (a) If z_1 and z_2 are two complex numbers, then show that $|z_1 + z_2| \leq |z_1| + |z_2|$.

(b) Find the different values of $(1+i)^{1/3}$. 7+7

5. (a) Check the continuity of the following function at $x = 0$:

$$f(x) = \begin{cases} 2x - 1, & \text{if } x < 0 \\ 2x + 1, & \text{if } x \geq 0 \end{cases}$$

(b) Show that the matrix $A = \begin{bmatrix} 4 & -6 & 1 \\ -1 & -1 & 1 \\ 4 & 11 & -1 \end{bmatrix}$ is invertible. Find adj(A) and A^{-1}. 7+7

6. (a) Calculate the mean and median of the following data using step deviation method :

Number of workers	*Wages per week up to (₹)*
12	15
30	30
65	45
107	60
157	75
202	90
222	105
230	120

(b) Find the standard deviation of the following data :

38, 70, 48, 34, 42, 55, 63, 46, 54, 44 7+7

7. (a) Evaluate $\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x} dx$.

(b) If A and B are invertible square matrices of the same order, then show that AB is also invertible and $(AB)^{-1} = B^{-1} A^{-1}$. 7+7