ROLL NO. _____

Code: **DE51/DC51**   Subject: **ENGINEERING MATHEMA...**

DipIETE – ET/CS

Time: 3 Hours   **DECEMBER 2012**   Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1   **Choose the correct or the best alternative in the following:** (2×10)

a. $\underset{\theta \to 0}{\text{Lt}} \dfrac{1 - \cos m\theta}{1 - \cos n\theta}$ is equal to

   (A) $m^2 n^2$ **(B)** $\dfrac{m}{n}$

   (C) $\dfrac{m^2}{n^2}$ **(D)** $m^2 - n^2$

b. If $y = e^{\tan x}$ then $\dfrac{dy}{dx}$ is equal to

   (A) $e^{\left(\sec x . \tan^2 x\right)}$ **(B)** $e^{(\tan x)} . \sec^2 x$

   (C) $e^{(\tan x . \sec x)}$ **(D)** $e^{(\sec x)} . \tan^2 x$

c. $\int \tan^2 x . dx$ is equal to

   (A) $\tan x$ **(B)** $\tan x . \sec x$

   (C) $\tan^2 x$ **(D)** $\tan x - x$

d. If $\begin{bmatrix} x + 3 & 2y + x \\ z - 1 & 4a - 6 \end{bmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & +2a \end{bmatrix}$, then x, y, z and a is equal to

   (A) $x = -3, y = -2, z = 4, a = 3$ **(B)** $x = 2, y = -3, z = 4, a = 2$

   (C) $x = 1, y = 2, z = 3, a = 4$ **(D)** $x = 3, y = 2, z = -4, a = -3$

e. If $\Delta = \begin{vmatrix} 2x-1 & x+7 & x+4 \\ x & 6 & 2 \\ x-1 & x+1 & 3 \end{vmatrix} = 0$, then x is equal to

   (A) 4, 5, 6   (B) 1, 2, 3
   (C) 1,–2,3   (D) $-4,-7,2$

f. The 5th term in the expansion of $\left(\dfrac{4x}{5} - \dfrac{5}{2x} \right)^8$ is equal to

   (A) 1210   (B) 1020
   (C) 1120   (D) 1220

g. The solution of the differential equation $\dfrac{dy}{dx} = e^{x-y} + x^2 e^{-y}$ is equal to

   (A) $e^{-y} = e^x + \dfrac{x^2}{2} + c$ (B) $y = e^x + \dfrac{x^3}{3} + c$

   (C) $y = e^{-x} + \dfrac{x^2}{2} + c$ (D) $e^y = e^x + \dfrac{x^3}{3} + c$

h. If $\dfrac{\tan 69° + \tan 66°}{1 - \tan 69° . \tan 66°} = x$, then x is equal to

   (A) ½   (B) -1
   (C) 1   (D) $\sqrt{3}$

i. The area of the quadrilateral whose vertices, taken in order, are $(1,2), (6,2), (5,3)$ and $(3,4)$ is equal to

   (A) $\dfrac{15}{3}$ sq units   (B) $\dfrac{5}{2}$ sq units

   (C) $\dfrac{11}{2}$ sq units   (D) $\dfrac{12}{3}$ sq units

j. The equation of the circle whose area is 154 sq. units and having 2x-3y+12 = 0 and x + 4y-5 = 0 as diameters, is given by

   (A) $x^2 + y^2 - 6x + 4y - 36 = 0$ (B) $x^2 - y^2 + 6x - 4y - 36 = 0$
   (C) $x^2 + y^2 + 6x - 4y - 36 = 0$ (D) $x^2 + y^2 - 6x - 4y + 36 = 0$

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. If $y = X^{X^{X^{.............\infty}}}$, then prove that $X\dfrac{dy}{dX} = \dfrac{y^2}{(1 - y \log_e X)}$ **(8)**

    b. Find the equation of the tangent to the curve $x^2 + 2y = 8$ which is perpendicu...
to the line $x - 2y + 1 = 0$. **(8)**

Q.3 a. Evaluate $\int e^{-x} \cdot \cos x \, dx$ **(8)**

    b. Evaluate $\displaystyle\int_{1}^{2} \frac{1}{x(1 + x^2)} dx$ **(8)**

Q.4 a. Find the matrix A satisfying the equation $\begin{bmatrix} 2 & 1 \\ 3 & 3 \end{bmatrix} A \begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ **(8)**

    b. Solve the following set of equations by using Cramer's rule
$2x - y + 3z = 9, x + y + z = 6, x - y + z = 2$ **(8)**

Q.5 a. Solve $x^2 dy + y(x + y) dx = 0$ **(8)**

    b. Solve $(1 + y^2) dx + x dy = \tan^{-1} y \, dy$ **(8)**

Q.6 a. Prove that the coefficient of x^r in the expansion of $(1 - 4x)^{-\frac{1}{2}}$ is $\dfrac{(2r)!}{(r!)^2}$ **(8)**

    b. Find three number in A.P. whose sum is 21 and their product is 315. **(8)**

Q.7 a. If A, B, C are the angles of a triangle, then prove that, tan 2A+tan 2B+tan 2C
= tan 2A.tan 2B.tan 2C **(8)**

    b. Prove that, $\sin 10° \cdot \sin 50° \cdot \sin 60° \cdot \sin 70° = \dfrac{\sqrt{3}}{16}$ **(8)**

Q.8 a. Find the equation of the straight lines through the point $(2, -1)$ and making an
angle of $45°$ with the line 6x+5y-1 = 0. **(8)**

    b. Find the equation of lines parallel to $3x - 4y - 5 = 0$ at a unit distance from it. **(8)**

Q.9 a. Find the equation of the circle which passes through the points $(3, -2), (-2, 0)$ and
having its centre on the line $2x - y - 3 = 0$ **(8)**

    b. Find the vertex, focus directrix, latus-rectum and axis of parabola
$3x^2 + 12x - 8y = 0$. **(8)**