ROLL NO. _____

Code: DE51/DC51 Subject: ENGINEERING MATHEMATICS - I

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. $\lim_{\theta \to 0} \frac{1-\cos m\theta}{1-\cos n\theta}$ is equal to

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

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

b. If $y = e^{\tan x}$ then $\frac{dy}{dx}$ 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 5^{th} term in the expansion of $\left(\frac{4x}{5} - \frac{5}{2x}\right)^8$ is equal to

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

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

(A) $e^{-y} = e^x + \frac{x^2}{2} + c$ **(B)** $y = e^x + \frac{x^3}{3} + c$
(C) $y = e^{-x} + \frac{x^2}{2} + c$ **(D)** $e^y = e^x + \frac{x^3}{3} + c$

h. If $\frac{\tan 69^\circ + \tan 66^\circ}{1 - \tan 69^\circ . \tan 66^\circ} = x$, 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) $\frac{15}{3}$ sq units **(B)** $\frac{5}{2}$ sq units
(C) $\frac{11}{2}$ sq units **(D)** $\frac{12}{3}$ 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 $X\frac{dy}{dX} = \frac{y^2}{(1 - y\log_e X)}$ **(8)**

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

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

b. Evaluate $\int_1^2 \frac{1}{x(1+x^2)} dx$ **(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 $(1 + y^2)dx + xdy = \tan^{-1} y dy$ **(8)**

Q.6 a. Prove that the coefficient of x^r in the expansion of $(1 - 4x)^{-1/2}$ is $\frac{(2r)!}{(r!)^2}$ **(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, $\sin 10^\circ.\sin 50^\circ.\sin 60^\circ.\sin 70^\circ = \frac{\sqrt{3}}{16}$ **(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)**