ROLL NO. _____

Code: DE51/DC51/DE101/DC101 Subject: ENGINEERING MATHEMATICS - I

DipIETE – ET/CS (Current & New Scheme)

Time: 3 Hours **JUNE 2017** **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. If $y = \sin^2 x + \cos x + \frac{1}{x}$, then $\frac{dy}{dx}$ is,

(A) $\sin x \cos x - \sin x - \frac{1}{x^2}$ **(B)** $\sin 2x - \sin x - \frac{1}{x^2}$

(C) $\sin x \cos x + \sin x + \frac{1}{x^2}$ **(D)** $\sin 2x + \sin x + \frac{1}{x^2}$

b. If A is a symmetric matrix , then A^T is,

(A) A^{-1} **(B)** $-A$

(C) A **(D)** $-A^{-1}$

c. The order (O) and degree (D) of the differential equation $\left[1+(\frac{dy}{dx})^3\right]^2 = (\frac{d^2y}{dx^2})^2$ is

(A) O = 1, D = 2 **(B)** O = 2, D = 1

(C) O = 2, D = 2 **(D)** O = 3, D = 2

d. The radian measurement of the angle 135^0 is

(A) $\frac{4}{3}\pi^c$ **(B)** $\frac{3}{4}\pi^c$

(C) $\frac{5}{9}\pi^c$ **(D)** $\frac{9}{5}\pi^c$

e. The distance between the points (-1, -4) and (3, 5) is

(A) $\sqrt{97}$ **(B)** $\sqrt{51}$

(C) $\sqrt{89}$ **(D)** $\sqrt{13}$

f. The value of $Limit_{x\to -3}\dfrac{x^3+27}{x+3}$ is

(A) 57 **(B)** 46
(C) 36 **(D)** 27

g. The equation of the directrix of the parabola $y^2=8x$ is

(A) $x-2=0$ **(B)** $x+2=0$
(C) $x+4=0$ **(D)** $x-4=0$

h. The middle term in the expansion of $(x^{1/3}-\dfrac{1}{2}x^{-2})^6$ is

(A) $\dfrac{5}{2x^4}$ **(B)** $-4x^3$

(C) $-5x^{-4}$ **(D)** $\dfrac{-5}{2x^5}$

i. $\int\left(\dfrac{1}{x^2}-\dfrac{\sec^2 x}{\tan^2 x}\right)dx$ is

(A) $\cot x-\dfrac{1}{x}+c$ **(B)** $\tan x-\dfrac{1}{x}+c$
(C) $\log x-\cot x+c$ **(D)** $\log x+\cot x+c$

j. The differential coefficient of $\tan(\log x)$ is

(A) $\sec^2(\log x)$ **(B)** $\sec(\log x)\tan(\log x)$
(C) $\dfrac{\sec^2(\log x)}{x}$ **(D)** $x\sec^2(\log x)$

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

Q.2 a. Solve $\dfrac{dy}{dx}=\dfrac{y}{x}+x\sin(y/x)$. **(8)**

b. Solve $\sec^2 y\dfrac{dy}{dx}+x\tan y=x^3$. **(8)**

Q.3 a. Prove that $\cos^2 A+\cos^2(A+120^0)+\cos^2(A-120^0)=\dfrac{3}{2}$. **(8)**

b. If $A+B+C=180^0$, show that $\tan A+\tan B+\tan C=\tan A\tan B\tan C$. **(8)**

Q.4 a. Find the equation of the line passing through the point of intersection of the lines $2x+3y-7=0$ and $3x-5y-1=0$ and perpendicular to the line $2x+3y-500=0$. **(8)**

b. Find the angle between the lines $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$. Deduce the condition for parallelism and perpendicularity. **(8)**

Q.5 a. If $y=x^{\sin x}+(\sin x)^x$, find $\frac{dy}{dx}$. **(8)**

b. Find the equation of the ellipse with eccentricity e = 3/4, foci on *Y*-axis, center at origin and passing through the point (6, 4). **(8)**

Q.6 a. Find the term independent of *x* in the expansion of $\left(\sqrt{x}+\frac{1}{3x^2}\right)^{10}$. **(8)**

b. If the sum of *p* terms of an A.P. is same as the sum of its *q* terms, show that the sum of its (*p* + *q*) terms is zero. **(8)**

Q.7 a. Find the equation of the circle passing through the point (2, 4) and having center at the intersection of the lines $x-y=4$ and $2x+3y=-7$. **(8)**

b. Find the maximum and minimum values of $3x^4-2x^3-6x^2+6x+1$ in the interval (0, 2). **(8)**

Q.8 a. Solve, with the help of matrices, the simultaneous equations: **(8)**

$x+y+z=3,\ x+2y+3z=4,\ x+4y+9z=6$.

b. Find the inverse of the matrix $A=\begin{bmatrix}0&1&2\\1&2&3\\3&1&1\end{bmatrix}$ by elementary row transformation. **(8)**

Q.9 a. Evaluate $\int \sin^2 2x\cos 3x dx$. **(8)**

b. Evaluate $\int_0^{\pi/2} x^2\sin^2 x dx$. **(8)**