ROLL NO. _____

Code: DE105/DC105 **Subject: ENGINEERING MATHEMATICS II**

DipIETE – ET/CS *{NEW SCHEME}*

Time: 3 Hours **JUNE 2015** **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. The value of the $\lim_{x \to 0}\left(\frac{1}{x^2} - \frac{1}{\sin^2 x}\right)$ is equal to

(A) 0 **(B)** 1

(C) $\frac{-1}{3}$ **(D)** None of these

b. The value of $\int_0^{\frac{\pi}{2}} \cos^3 x \sin^4 x \, dx$ is equal to

(A) $\frac{2}{35}$ **(B)** $\frac{3}{7}$

(C) $\frac{4}{7}$ **(D)** None of these

c. The solution of the equation $z^4 + 1 = 0$ is

(A) $\frac{\pm 1 + i}{\sqrt{2}}$ **(B)** 1

(C) -1 **(D)** None of these

d. If the vector $2i-4j+5k$, $i-mj+k$ *and* $3i+2j-5k$ are coplanar, then the value of m will be

(A) $\frac{1}{2}$ **(B)** $\frac{26}{25}$

(C) $\frac{-1}{2}$ **(D)** None of these

e. The value of $\vec{A}\times\left(\vec{B}+\vec{C}\right)+\vec{B}\times\left(\vec{C}+\vec{A}\right)+\vec{C}\times\left(\vec{A}+\vec{B}\right)$ is

(A) 0 **(B)** $\vec{A}$

(C) $\vec{B}$ **(D)** $\vec{C}$

f. The solution of $\frac{d^2y}{dx^2}-8\frac{dy}{dx}+16y=0$ is

(A) 0 **(B)** $y=(c_1+c_2)e^{4x}$

(C) -1 **(D)** None of these

g. The series $6-10+4+6-10+4-6+4.....\infty$ is

(A) Convergent **(B)** Divergent

(C) Oscillatory Series **(D)** None of these

h. A sequence which is monotonic and bounded is

(A) Convergent **(B)** Divergent

(C) Oscillatory Series **(D)** None of these

i. The Laplace Transform of t^3e^{-3t} is

(A) 1 **(B)** $\frac{s}{(s+3)^3}$

(C) $\frac{6}{(s+3)^4}$ **(D)** None of these

j. The Inverse Laplace Transform of $\frac{1}{s^n}$ exist only when the value of n is

(A) Positive Integer **(B)** Negative Integer

(C) Zero **(D)** None of these

ROLL NO. _____

Code: DE105/DC105 **Subject: ENGINEERING MATHEMATICS II**

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

Q.2 a. By Using Taylor's series, calculate the value of $f\left(\frac{11}{10}\right)$, Where $f(x) = x^3 + 8x^2 + 15x - 24$ **(8)**

b. Evaluate $\underset{x \to 0}{lt}\left(\frac{1}{x} - \cot x\right)$ **(8)**

Q.3 a. Evaluate by using the reduction formula $\int_0^{\frac{\pi}{2}} \sin^3\theta \cos^4\theta \cos 2\theta \, d\theta$ **(8)**

b. Find the common area lie between the parabolas $x^2 = ay$ *and* $y^2 = bx$ **(8)**

Q.4 a. State and prove De'Moviere's theorem. **(8)**

b. Separate the real and imaginary part of $\tan(x + iy)$ **(8)**

Q.5 a. Show that the vectors $\vec{A}, \vec{B}, \vec{C}$, if **(8)**
$\vec{A} = 5\vec{i} + 6\vec{j} + 7\vec{k}$, $\vec{B} = 7\vec{i} - 8\vec{j} + 9\vec{k}$, $\vec{C} = 3\vec{i} + 20\vec{j} + 5\vec{k}$ are coplanar

b. Prove that $\vec{i} \times (\vec{p} \times \vec{i}) + \vec{j} \times (\vec{p} \times \vec{j}) + \vec{k} \times (\vec{p} \times \vec{k}) = 2\vec{p}$ where
$\vec{p} = p_1\vec{i} + p_2\vec{j} + p_3\vec{k}$ **(8)**

Q.6 a. Solve $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9 = \frac{e^{-3x}}{x^3}$ **(8)**

b. An inductance of 2 henries and a resistance of 20 ohms are connected in series with e.m.f E Volts. If the current is zero when t = 0, find the current at the end of 0.01 sec, if E = 100 volts. **(8)**

Q.7 Examine the following series: **(16)**

(i) $\sum \sqrt{(n^4+1)} - \sqrt{(n^4-1)}$

(ii) $\sum \frac{(n+1)^n}{n^{n+1}} x^2$

Q.8 Find the Laplace Transform of f(t) , where **(16)**

(i) $f(t) = \begin{cases} \frac{t}{a}, & \text{where} \quad 0 < t < a \\ 1, & \text{where} \quad a < t > \infty \end{cases}$

(ii) $f(t) = \frac{e^{-t}\sin t}{t}$

Q.9 a. Find the Inverse Laplace Transform of $\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}$. **(8)**

b. Apply convolution theorem, find $L^{-1}\left\{\frac{s^2}{(s^2+a^2)^2}\right\}$ **(8)**