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

DipIETE – ET/CS (New Scheme)

Time: 3 Hours   **DECEMBER 2018**   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 $\lim_{x \to 0} \frac{logx}{cotx}$ is
  (A) 2   **(B)** 3
  (C) 1   **(D)** 0

b. The value of $\int_{0}^{\pi/2} Sin^6 x\, dx$ is
  (A) $3\pi/12$ **(B)** $5\pi/32$
  (C) $7\pi/13$ **(D)** $\pi/12$

c. If $z = 1+i$ then z^2 is
  (A) 5i   **(B)** 4i
  (C) 2i   **(D)** 3i

d. If A= 2i+j+k, B = 3i+2j +k , then | A x B | is
  (A) √178   **(B)** √179
  (C) √168   **(D)** None of these

e. The series √1/4 + √ 2/6 + √3/8 + √n/2(n+1) is
  (A) divergent   **(B)** convergent
  (C) oscillating   **(D)** none of these

f. The solution of the differential equation $\frac{d^2 y}{dx^2} - 8\frac{dy}{dx} + 15y = o$ is

  (A) $y = c_1 e^{3x} + c_2 e^{5x}$ **(B)** $y = c_1 e^{3x} - c_2 e^{5x}$

  (C) $y = c_1 e^{3x} + c_2 e^{4x}$ **(D)** $y = c_1 e^{4x} + c_2 e^{5x}$

g. The complementry function of $D^2x + 4Dx + 5y = 0$

(A) $e^{-2x}(A\cos x + B\sin x)$ (B) $e^{-2x}(A\cos x - B\sin x)$

(C) $e^{-4x}(A\cos x + B\sin x)$ (D) $e^{-5x}(A\cos x - B\sin x)$

h. The Laplace transform of $1/\sqrt{t}$ is

(A) $\sqrt{\pi}/4s$ (B) $)\sqrt{\pi}/2s$

(C) $\sqrt{\pi}/s$ (D) $-\sqrt{\pi}/s$

i. The value of $L^{-1}\left\{\dfrac{1}{\sqrt{s}}\right\}$ is

(A) $-1/\sqrt{\pi}t$ (B) $2/\sqrt{\pi}t$
(C) $1/\sqrt{\pi}t$ (D) $3/\sqrt{\pi}t$

j. The particular integral of $(D^2 - 2D + 4)\,y = e^x \cos x$ is

(A) $\dfrac{1}{2}e^{-x}\cos x$ (B) $\dfrac{1}{2}e^x\cos x$

(C) $\dfrac{1}{2}e^{-x}\sin x$ (D) $\dfrac{1}{2}e^x\sin x$

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

Q.2 a. Expand $\tan x$ by Maclaurin's series upto the torn containing x^4.   **(8)**

b. Evaluate $\lim_{x\to 0}\dfrac{\sqrt{1+\sin x}-\sqrt{1-\sin x}}{x}$ **(8)**

Q.3 a. Evaluate $\int_0^{\frac{\pi}{6}} \cos^5\theta\, d\theta$ **(8)**

b. Find the area of the surface revolution formed by revolving   the curve

$r = 2a\cos\theta$ about the initial line.   **(8)**

Q.4 a. Express $(1+\cos\theta + i\,\sin\theta)$ in modulus - arguments form.   **(8)**

b. The admittance and current are given the complex number 7+5j and 17-16j respectively. Find the voltage of the current.   **(8)**

Q.5 a. Show that the vector 2i-j+k, i-3j-5k and 3i – 4j -4k form the sides of a right angled-triangle.   **(8)**

b. A rigid body is rotating with angular velocity 2 radians/sec about an axis OR where R is 2i-2j +k and O is the origin. Find the vector of the point 3i +2j –k on the body.   **(8)**

Q.6   a. Solve $\dfrac{d^2 y}{dx^2} - 4y = (1 + e^x)^2$ **(8)**

b. A voltage $E\ e^{-at}$ is applied at $t = 0$ to an LR circuit. Find the current at any time t.   **(8)**

Q.7   a. Test for the absolute convergence of the series $\sum_{n=2}^{\infty} \dfrac{(-1)^n}{n(\log n)^2}$.   **(8)**

b. Test for the convergence of the series $1 + \dfrac{x}{2} + \dfrac{x^2}{5} + \dfrac{x^3}{10} + \ldots\ldots\ldots + \dfrac{x^n}{n^2 + 1}$.   **(8)**

Q.8   a. Find the Laplace transform of $f(t) = \sin at \sin bt$.   **(8)**

b. Find the Laplace transform of $\dfrac{1 - \cos t}{t^2}$ **(8)**

Q.9   a. Find the inverse Laplace transform of $\log \dfrac{s+1}{s-1}$.   **(8)**

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