Registration No:._____

PNR No::114151MTH19371

Course Code: MTH107
Course Name: Elementary Mathematics for Engineers

Time Allowed: 03:00hrs ***Max.Marks: 100***

1. *This paper contains 6 questions divided in two parts.*
2. *All question are compulsory.*
3. *The marks assigned to each question are shown at the end of each question.*
4. *Attempt either (a) OR (b) from each question of Part B*
5. *Answer all the questions in serial order.*
6. *Do not write anything on the question paper except your registration number at the designed space*

Part A

Q1 (a) Find the basic solution of the following system of equation, identifying in each case of basic and non basic variables: $2x_1+x_2+4x_3=11$, $3x_1+x_2+5x_3=14$.

[2.5 Marks]

(b) Evaluate $\int \frac{x}{1+x^2} dx$

[2.5 Marks]

(c) if $y=\frac{e^x-e^{-x}}{e^x+e^{-x}}$,find $\frac{dy}{dx}$.

[2.5 Marks]

(d) If *z = f (x + ct) + g(x – ct), prove that :* $\frac{\partial^2 z}{\partial t^2} = c^2 \frac{\partial^2 z}{\partial x^2}$

[2.5 Marks]

(e) Differentiate the Function $e^{sin^2(logx)}$ with respect to x.

[2.5 Marks]

(f) If x = a(t – sint), y = a(1- cost). Find dy/dx. .

[2.5 Marks]

(g) If *p = Today is Sunday, q = It is sunny day, then translate* $\sim p \wedge q$ into logical sentence

[2.5 Marks]

(h) IF *A= { 1, 3, 5, 9} , B= {1, 2, 5, 7, 9} , Show that*
$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

[2.5 Marks]

(I) *Evaluate the integral* $\int_0^{\frac{\pi}{4}} \frac{dx}{1-sinx}$

[2.5 Marks]

(j) Integrate $\frac{sin\sqrt{x}}{\sqrt{x}}$ with respect to x.

[2.5 Marks]

PART B

Q2.(a) Solve $\int \frac{x^2+x+1}{(x-2)(x-1)^2}$

[15 Marks]

OR

(b)

(i) Solve $\int \frac{x^2 tan^{-1}x dx}{(1+x^2)}$ [5]

(ii) Evaluate $\int sin^{-1}\sqrt{\left(\frac{a}{a+x}\right)}\,dx$ [10]

.

[15 Marks]

Q3 (a) Differentiate $y = \left(\frac{x^2-2x}{3x-4x^2}\right)^3 + Sin(\sqrt{x}) + Cos^{-1}\left(\frac{x^2+2x}{2x}\right)$

[15 Marks]

OR

(b) Find the maximum values of $x^5 - 5x^4 + 5x^3 - 1$.

[15 Marks]

Q4.(a) Evaluate $\int_0^{\frac{\pi}{2}} \frac{dx}{9\,cosx+12\sin x}$

OR

(b) Find by summation the value of $\int_a^b x^2 dx$

[15 Marks]

Q5. (a)(ii) Convert the following LPP to the standard form [5]

Min Z = 3x + 2y +5t

Subject to the constraints

$-5x + 2y \leq 5$

$2x + 3y + 4t \geq 7$

$2x + 5t = -3$

x, y ≥ 0.

(ii) Solve the following graphically [10]

Max $Z = 5x_1 + 7x_2$

subject to

$x_1 + x_2 \leq 4$

$5x_1 + 8x_2 \leq 24$

$10x_1 + 7x_2 \leq 35$

$x_1 \geq 0, x_2 \geq 0$

OR

b(i) Write the duals of the following problem

$Max\ Z = 10x_1 + 5x_2 + 13x_2 + 19x_3$

subject to

$6x_1 + 5x_2 + 3x_3 \leq 26$

$4x_1 + 2x_2 + 5x_3 \leq 7$

$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$

(ii) Find all basic solution to the following problem :

$Max\ Z = x_1 + 3x_2 + 3x_3$

subject

$x_1 + 2x_2 + 3 = 4, 2x_1 + 3x_2 + 5x_3 = 7, x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$

Which of the basic solution are (a) Non-degenerate basic feasible (b) Optimal basic feasible ?

[15 Marks]

Q6. (a)

(i). Evaluate $\lim_{x\to 0} \frac{e^{ax}-e^{bx}}{sinax-sinbx}$ [10]

(ii) Show that function f(x) = $\begin{cases} \frac{|X-A|}{X-a}; & x \neq a \\ 1 & ; x = a \end{cases}$ is continuous at x = a. [5]

[15 Marks]

OR

(b) (i) Find the domain and range of function f(x) = $\sqrt{(4-x^2}$ [5]

(ii) If $f(x) = 3x^4 - 5x^2 + 9$. Find f(-5) , $f(\frac{1}{x})$, $f(\frac{1}{x-1})$, f(x -3)

-- End of Question Paper --