III- SEM ELECT/ETC/AE&I/EEE/E&IC/E&M/ELECT(PT)/2019(W)/ (New)

Th. 1 ENGINEERING MATHEMATICS III

Full Marks: 80 Time : 3 Hours

Answer any **Five** Questions including Q No. 1& 2

Figures in the right hand margin indicates marks

1. Answer **ALL** the questions. 2x10

a) Find $(1 + w^2 - w)^3 + (1 - w^2 + w)^3$.

b) Find the rank of the matrix $\begin{bmatrix} 1 & 3 \\ 2 & 6 \end{bmatrix}$.

c) Find the C.F. of $(D^2 + 3)y = e^{2x}$.

d) Form the P.D.E. from $z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$, by eliminating arbritrary constant.

e) Find $L(e^{-2t} sint)$.

f) Find a_0 for $f(x) = e^{-x}$ in the interval $0 < x < 2\pi$.

g) Find the period of sin3x.

h) Find $\Delta^2(ab^x)$ where h = 1.

i) Find the 2nd approximation to the root corrected upto two decimal places of $x^3 - 5x + 1 = 0$ by bisection method in [2,3].

j) Find $\int_0^2 x^2 \, dx$ using trapezoidal rule taking h=1.

2. Answer any **SIX** questions. 5x6

a) Find the values of λ and μ for which the following system of equations
$2x + 3y + 4z = 2$
$3x + 4y - 2z = 5$
$4x + 6y + \lambda z = \mu$ have i) no solution, ii) infinite solutions, and iii) unique solution.

b) Solve $\frac{d^2y}{dx^2} + 2y = e^x \cos 2x$

c) Solve the P.D.E. $(x^2 - y^2 - z^2)p + 2xyq = 2xz$.

d) Find $L^{-1}\left(\frac{(3s+1)}{(s+1)(s^2+1)}\right)$.

e) Find the square root of $-5 + 12i$.

f) Use Lagrange's interpolation formula to fit a polynomial to the data

x	3	2	1	-1
y	3	12	15	-21

g) Find the Fourier co-efficient a_0 and a_n for $f(x) = \begin{cases} -\pi & -\pi < x < 0 \\ x & 0 < x < \pi \end{cases}$

5

3.

a) If $x - \frac{1}{x} = 2\cos\theta$. then prove that $x^n + \frac{1}{x^n} = 2\cos n\theta$. 5

b) Find the fourier coefficient b_n for $f(x) = x^3$ in $-\pi < x < \pi$. 5

4.

a) Find the root of the equation $3x^3 - 9x^2 + 8 = 0$ by Newton-Raphson method correct upto 3 decimal places. 5

b) Find $L\left(\frac{e^{2t}\sin 3t}{t}\right)$. 5

5.

a) Using Newton's backward difference interpolation formula find the value of f(1.6).

x :	1	1.4	1.8	2.2
y :	3.49	4.82	5.96	6.5

5

b) Solve $(D^2 + 3D + 2)\, y = 4\cos^2 x$ 5

6.

a) Obtain the Fourier series for $f(x) = \begin{cases} -x & -\pi < x < 0 \\ x & 0 \le x < \pi \end{cases}$

and show that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots\ldots\ldots$ 5

b) Find $L^{-1}\left(\log\left(\frac{s+1}{s-1}\right)\right)$

7.

a) Find $\int_0^5 \frac{1}{4x+5}\,dx$ using Simpson's 1/3 rule using 10 subintervals. 5

b) Find $L(e^{-t}\sin^2 3t)$. 5