Symbol Number: ____________ Invigilator's Sign: ____________ Superintendent's Sign: ____________

Symbol No. in Words: ______________________________ Code No. [ ]

School: SOE	Level: BE	Program: BCE, BEEE	Exam Year: 2080, Push
Subject: Engineering Mathematics III (EG501SH)			Year/Part: II/I (Model Question)
GROUP A (Multiple-Choice Questions)			[10x1=10]

i. *Answers should be given by filling the Multiple-Choice Questions' Answer Sheet.*
ii. *Rough can be done in the main answer sheet*
iii. *Maximum time of 20 minutes within the total time is given for this group.*

Code No. [ ]

1. The determinant of an orthogonal matrix is
   A . 1   b. -1
   c. ± 1 d. 0
2. If λ is eigenvalue of matrix A then $\frac{1}{\lambda}$ is eigenvalue of the matrix
   a . A^T b. $-A^T$
   c. A^{-1} d. none
3. For what value of k, do the equations x+3y = 1 and 4x+12y = k have infinite solutions:
   a. 0   b. 1
   c. -4   d. 4
4. The inverse Laplace transform of $tan^{-1}(\frac{2}{s})$ is
   a. sin2t   b. t sin2t
   c. $\frac{sin2t}{t}$ d. t^2 sin2t
5. The Laplace transform of t^3e^{2t} is
   a. $\frac{\mathbf{6}}{(s-\mathbf{2})^{\mathbf{4}}}$ b. $\frac{4!}{(s-2)^4}$
   c. $\frac{4!}{(s+2)^4}$ d. $\frac{\mathbf{6}}{(s+\mathbf{2})^{\mathbf{3}}}$
6. The Fourier series expansion of an even periodic functions contains
   a. only cosine term   b. cosine term and constant
   c. only sine term   d. sine term and constant.
7. The constant term in the Fourier series expansion of f(x) = |x| in (-1,1) is
   a.π b. 1
   c. -1   d. $\frac{1}{2}$
8. The inequality Ax$\geq$ b can be converted into equality by using
   a. slack variable   c. surplus variable
   b. artificial variable   d. none
9. If c represent a line segment between (0,0,0) and (1,1,1) then
   $$\int_c (y+z)dx + (x+z)dy + (x+y)dz$$
   a . 3   b . 4
   c. 2   d. 0
10. Area of region R bounded by curve C is given by
    a.$\int_c xdy - ydx$ b.$\frac{1}{2}\int_c xdy - ydx$
    c.$\int_c xdy + ydx$ d.$\frac{1}{2}\int_c xdy + ydx$

Multiple Choice Questions' Answer Sheet

Marks Secured: ____________

In Words: ____________

Examiner's Sign: ________ Date: ________

Scrutinizer's Marks: ____________

In Words: ____________

Scrutinizer's Sign: ________ Date: ________

Corrected Fill

Ⓐ ● Ⓒ Ⓓ

Incorrected Fill

1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

MANMOHAN TECHNICAL UNIVERSITY
Office of the Controller of Examinations
Exam Year: 2080, Push

School: SOE	**Level: BE**	**Program: BCE, BEEE**	**Time: 3 Hours**
Year/Part: II/I (Model Question)			**Full Marks: 50**
Subject: Engineering Mathematics III (EG501SH)			**Pass Marks: 20**

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

GROUP A ***(Multiple-Choice Questions and Answer Sheet in separate paper)*** **[10x1=10]**

GROUP B ***(Attempt Any Eight)*** **[2x8=16]**

1. Prove that every complex square matrix can be expressed uniquely as the sum of Hermitian and skew-Hermitian matrix. [2]
2. Find the rank of the matrix by reducing echelon form $\begin{bmatrix} 1 & 3 & -2 & 1 \\ 1 & 1 & 1 & 1 \\ 2 & 0 & -3 & 2 \\ 3 & 3 & -3 & 3 \end{bmatrix}$. [2]
3. Find inverse Laplace transform of $\frac{s^2+6}{(s^2+1)(s^2+4)}$. [2]
4. Find Laplace transform of $f(t)=\begin{cases} t^2\,; & 0 < t < 1 \\ 4t\,; & t > 1 \end{cases}$. [2]
5. Obtain half range Fourier sine series for the function e^x in $0 < x < 1$. [2]
6. Solve given LPP by graphical method
$$Max\ z = 5x + 3y$$
Subject to
$$3x + 5y \le 15$$
$$5x + 2y \le 10$$
$$x, y \ge 0\,.$$
[2]
7. Test the consistency of the system of equations
$$x + y + z = -3$$
$$3x + y - 2z = -2$$
$$2x + 4y + 7z = 7$$
. If consistent find its solution. [1+1]
8. Using Green's theorem, find area of ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$. [2]
9. Show that $\vec{F} = yz\,\vec{\imath} + zx\,\vec{\jmath} + xy + \vec{k}$ is irrotational and also find its scalar potential function. [1+1]

GROUP C ***(Attempt Any Six)***

1. Express $\begin{vmatrix} b^2+c^2+1 & c^2+1 & b^2+1 & b+c \\ c^2+1 & c^2+a^2+1 & a^2+1 & c+a \\ b^2+1 & a^2+1 & a^2+b^2+1 & a+b \\ b+c & c+a & a+b & 3 \end{vmatrix}$ as the square of determinant and hence find its value. [2+2]
2. Verify Cayley – Hamilton theorem for the matrix A = $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$. Also find its inverse. [3+1]
3. Obtain the Fourier series for the function $x - x^2$ from $-\pi\ to\ \pi$ and hence deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \frac{1}{5^2} - \cdots$ [3+1]

4. Solve following LPP using dual method

$$Min\ P = 4x + 3y + 8z$$

Subject to

$$\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} \geq \begin{bmatrix} 2 \\ 5 \end{bmatrix}.$$

[4]

5. Verify Gauss' divergence theorem for $\vec{F} = x^2\vec{\imath} + z\vec{\jmath} + yz\,\vec{k}$ where v is the region bounded by the cube x = 0 , x = 1 , y = 0 , y = 1 ,z = 0 , z = 1 . [4]

6. Find the work done in moving particle in the field $\vec{F} = (x - y)\,\vec{\imath} + (x + y)\vec{\jmath}$ along one round of the curve bounded by $y^2 = x$ and $y = x^2$. [4]

7. p Define Laplace transform. Solve the differential equation by using Laplace transform: Y'' + 4y' + 3y = t given that y(0) = 0, y'(0) = 1. [1+3]

∾∾ ***The End*** ∾∾