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Reg. No.....

Name.....

M.Sc. (BIOMEDICAL INSTRUMENTATION) DEGREE EXAMINATION FEBRUARY 2024

First Semester

BMI 101—ENGINEERING MATHEMATICS

(2023 Admissions – Regular / 2020–22 Admissions – Supplementary / 2019 Admissions – First Mercy Chance / 2018 Admissions – Second Mercy Chance / 2017 Admissions – Final Mercy Chance)

Time : Three Hours | Maximum Marks : 100

Answer any **ten** *questions.*
Each question carries 10 *marks.*

I. (a) Find the Laplace transform of :

$$f(t)=\begin{cases}\sin\left(t-\pi/3\right) \text{ for } t>\pi/3\\ 0 \qquad\quad \text{for } t<\pi/3\end{cases}$$

(b) Find the inverse Laplace transform of $s^2/(s+a)^3$.

II. Using Laplace transform, evaluate $\int_0^\infty te^{-2t}\sin 3t.\,\mathrm{d}t$.

III. Solve using Laplace transform method $y'''(t)-k^4\,\mathrm{Y}(t)=0$, given $y(0)=1, y'(0)=y''(0)=y'''(0)=0$.

IV. Find the half range cosine series for the function $f(x)=(x-1)^2$ in the interval $0<x<1$.

V. Find the Fourier integral representations of the function $f(x)=\begin{cases}2,|x|<2\\ 0,|x)>2\end{cases}$.

VI. Show that $\beta(m+1,n)/m=\beta(m,n)/(m+n+1)$.

VII. Find the Fourier transform of :

$$f(x)=\begin{cases}1-x^2,|x|\le 1\\ 0, \quad |x|>1\end{cases}$$ and hence evaluate $\int_0^\infty[x.\cos x-\sin x]/x^3 x\cos\frac{x}{2}.\,dx$.

Turn over

VIII. Using Parsaval's identity, prove that $\int_0^{\infty} t^2 / \left(t^2+1\right)^2 .dt = \pi/4$.

IX. Two random variables have the regression lines with equations $3x+2y=26$ and $6x+y=31$. Find the mean values and the co-efficient of correlation between them.

X. Explain the steps involved in testing of hypothesis.

XI. Using graphical method solve the following L.L.P.

Maximize : $z = 2x_1 + 3x_2$

subject to $x_1 - x_2 \leq 2$
$x_1 + x_2 \geq 4$
$x_1, x_2 \geq 0.$

XII. Solve the following transportation problem :

Source \ Destination	A	B	C	D	Availability
I	21	16	25	13	11
II	17	18	14	23	13
III	33	27	18	41	19
Requirement	6	10	12	15	43

(10 × 10 = 100)