K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Jan/Feb ~~Nov–Dec 2025~~ 2026
Program: B. Tech (Electronics and Telecommunication Engineering) Scheme: III /II/II B
~~Supplementary/Regular~~ Examination: SY Semester: III
Course Code: EXC 301 and Course Name: Applications of Mathematics in Engineering-I
Date of Exam: ~~25/11/2025~~ 29/01/2026 Duration: 2 Hours 30 Minutes Max. Marks: 60

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Find $L\left(\frac{1}{t}(e^{-at}-e^{-bt})\right)$.		1	3
b)	Obtain Fourier series of $f(x)=x^2$ in $(-\pi,\pi)$.		3	3
c)	If $\bar{F}=(x+2y+az)i+(bx-3y-z)j+(4x+cy+2z)k$ is irrotational, find the constants a, b, c.		6	3
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Using partial fraction method, find $L^{-1}\left(\frac{1}{(s-2)(s+2)^2}\right)$.		2	3
b)	Determine the constants a ,b ,c and d so that the function $f(z)=x^2+axy+by^2+i\,(cx^2+dxy+y^2)$ is analytic.		4	3
c)	If the matrix $A=\begin{bmatrix}1&0&-1\\1&2&1\\2&2&3\end{bmatrix}$, find Eigen values of A^t, A^{-1} and A^2.		5	3
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	i) Find $L\left(e^{-4t}\int_0^t u\sin 3u\,du\right)$.	6	1	3
	ii) Find $L\left(\int_0^t \frac{1-e^{-au}}{u}du\right)$	4		
b)	(i) Obtain the Fourier series for the function $f(x)=\begin{cases}\pi x & ,0\le x\le 1\\ 0 & ,1\le x\le 2\end{cases}$ Deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}\ldots=\frac{\pi^2}{8}$	6	3	3

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Jan/Feb ~~Nov – Dec 2025~~ 2026
Program: B. Tech (Electronics and Telecommunication Engineering) Scheme: III / II / IF B
Supplementary ~~Regular~~ Examination: SY Semester: III
Course Code: EXC 301 and Course Name: Applications of Mathematics in Engineering-I
Date of Exam: ~~25/11/2025~~ 29-01-2026 Duration: 2 Hours 30 Minutes Max. Marks: 60

	(ii) Find the Fourier Transform of $f(x) = \begin{cases} 1-x^2, & \lvert x\rvert \le 1 \\ 0, & \lvert x\rvert > 1 \end{cases}$	4		3
c)	i) Using Green's theorem evaluate $\oint(xy+y^2)\,dx + x^2\,dy$ where c is the closed curve of the region bounded by $y = x$ & $y = x^2$.	6	6	3
	ii) If $\phi = 3x^2y - y^3z^2$, find $grad\ \phi$ at the point $(1,-2,-1)$.	4		3
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	i) Find the inverse Laplace Transform of $\tan^{-1}\left(\frac{2}{s^2}\right)$.	6	2	3
	ii) Using convolution theorem, find $L^{-1}\left(\frac{s^2}{(s^2+9)^2}\right)$	4		3
b)	i) Find the analytic function whose imaginary part is $v = 3x^2y - y^3$. Also, find the corresponding real part of the analytic function.	6	4	3
	ii) Show that the function $w = \log z$ is analytic except at $z = 0$.	4		3
c)	i) Verify Cayley-Hamilton theorem and find A^{-1}, for the following matrices $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$	6	5	3
	ii) Determine whether following matrix is diagonalizable, if yes find the diagonal form D. $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.	4		3

****