

**K. J. Somaiya Institute of Technology, Sion, Mumbai-22**

(Autonomous College Affiliated to University of Mumbai)

**End Semester Exam** Nov – Dec 2022 DSY to be conducted in January 2023

Program: B.Tech. Examination: SY Semester: III

Course Code: EXC301 and Course Name: Applications of Mathematics in  
Engineering -I

Duration: **2.5** Hours

Max. Marks: 60

Instructions:

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

		Max. Marks	CO	BT level
<b>Q 1</b>	<b>Solve any six questions out of eight</b>	<b>12</b>		
i)	Find $L(\sin 2t \sin 3t)$	2	1	2
ii)	Find $L^{-1}\left(\frac{3s+4}{s^2+16}\right)$	2	2	2
iii)	Verify whether the function $f(z) = e^z$ is analytic?	2	4	2
iv)	Find the sum and product of the eigenvalues of $\begin{pmatrix} -17 & 18 & -6 \\ -18 & 19 & -6 \\ -9 & 9 & -2 \end{pmatrix}$	2	5	2
v)	Find $L\left(\frac{d}{dt}\left(\frac{\sin 3t}{t}\right)\right)$	2	1	1
vi)	Show that the function is harmonic $u = x^2 - y^2$	2	4	2
vii)	Prove that $\vec{F} = (2xy + z)\hat{i} + (x^2 + 2z^3y)\hat{j} + (3y^2z^2 + x)\hat{k}$ is irrotational.	2	6	2
viii)	Find the Fourier coefficient $a_0$ of $f(x) = x$ in $(0, 2\pi)$ .	2	3	2
<b>Q.2</b>	<b>Solve any four questions out of six</b>	<b>16</b>		
i)	Find Laplace transform of $te^{3t} \sin t$	4	1	3

vii)	Explain flash memories.	02	3	U
viii)	Explain 1 bit memory cell.	02	3	U
<b>Q.2</b>	<b>Solve any four questions out of six.</b>	<b>16</b>		
i)	Implement 2:1 MUX.	04	2	App
ii)	simplify $Y = \sum m(0,1,3,5,7,10,13) + d(2,8,12)$ using K-Map.	04	3	App
iii)	Design 4 bit shift register.	04	4	App
iv)	Explain DRAM with the help of diagram.	04	3	U
v)	State the Demorgan's theorem.	04	1	U
vi)	Implement EX-NOR gate using NAND gates only.	04	1	App
<b>Q.3</b>	<b>Solve any two questions out of three.</b>	<b>16</b>		
i)	Explain four bit Binary Adder using IC 7483.	08	2	U
ii)	Design three bit ring counter.	08	4	App
iii)	Write a short note on ROM and EPROM.	08	3	U
<b>Q.4</b>	<b>Solve any two questions out of three.</b>	<b>16</b>		
i)	Add the number using 2's complement (a) -34 and 15 (b) 24 and -30	08	1	App
ii)	Write short notes on Programmable Logic Array (PLA), and Programmable Array Logic (PAL).	08	5	U
iii)	Write VHDL code for Subtractor circuit and also draw the waveform.	08	6	App