ANJUMAN-I-ISLAM'S
AKTC KALSEKAR TECHNICAL CAMPUS
INNOVATIVE TEACHING · EXUBERANT LEARNING

School of Architecture

School of Engineering & Technology

School of Pharmacy

Knowledge Resource & Relay Centre (KRRC)

AIKTC/KRRC/SoET/ACKN/QUES/2019-20/ **Date:** 02/08/2022

School: SoET-CBCS **Branch:** EXTC ENGG. **SEM:** III

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- III	ETS301		✓	
2	Electronic Devices and Circuits I	ETC302		✓	
3	Digital System Design	ETC303		✓	
4	Circuit Theory and Networks	ETC304		✓	
5	Electronic Instrumentation and Control	ETC305		✓	

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

EXTC - sem - III - R-16

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03/06/2022
Afternoon

University of Mumbai
Examination First Half 2022
Program: BE Electronics and Telecommunication Engineering
Curriculum Scheme: Rev2016
Examination: SE Semester III
Course Code: ECC301and Course Name: Applied Mathematics-III

Time: 2 hour 30 minutes — Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the questions are compulsory and carry equal marks. 2 marks each**
1.	If Laplace transform $L\{f(t)\}=F(s)$ then $L\{e^{-at}f(t)\}$ is
Option A:	$F\left(\frac{s}{a}\right)$
Option B:	$F(s+a)$
Option C:	$F(as)$
Option D:	$F(s-a)$
2.	If the Fourier series of $f(x)=x^2,\ -\pi<x<\pi$ is $a_0+\sum_{n=1}^{\infty}a_n\cos nx+\sum_{n=1}^{\infty}b_n\sin nx$ then the value of b_n is
Option A:	$\frac{(-1)^n+1}{\pi^3 n^3}$
Option B:	$\frac{(-1)^n-1}{\pi n^2}$
Option C:	$\frac{(-1)^n+1}{\pi^2 n^2}$
Option D:	0
3.	If $\bar{f}=\text{grad}\left(xy^2+2yz+x\right)$, then $\text{div}\,\bar{f}$ is
Option A:	$x+z$
Option B:	0
Option C:	$2x$
Option D:	$2y+z$
4.	The orthogonal trajectories for the family of curves $e^{-x}\cos y=\alpha$ is
Option A:	$e^x\sin y=\beta$

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Option B:	$-e^{-x}\cos y=\beta$
Option C:	$e^{-2x}\sin y=\beta$
Option D:	$e^{-x}\sin y=\beta$
5.	Laplace inverse of $\frac{5s-7}{s^2+4}$ is
Option A:	$5\cos 2t-\frac{7}{2}\sin 2t$
Option B:	$5\cos 2t+7\sin 2t$
Option C:	$5\sin 2t-7\cos 2t$
Option D:	$5\sin 2t+\frac{7}{2}\cos 2t$
6.	Applying Green's theorem, the value of $\oint_C \bar{f}\cdot d\bar{r}$ where $\bar{f}=2xy^3 i+(x^2+y^2)j$ and C is the rectangle given by $x=\pm 2,\ y=\pm 1$ is
Option A:	5
Option B:	3
Option C:	1
Option D:	0
7.	Laplace transform of $t^{1/2}\ e^{-5t}$ is
Option A:	$\frac{\Gamma(1/2)}{(s+5)^{1/2}}$
Option B:	$\frac{\Gamma(3/2)}{(s+5)^{1/2}}$
Option C:	$\frac{\Gamma(3/2)}{(s+5)^{3/2}}$
Option D:	$\frac{\Gamma(1/2)}{(s+5)^{3/2}}$
8.	If the half range sine series of $f(x)=x,\ 0\le x<2$ is $\sum_{n=1}^{\infty} b_n \sin\frac{n\pi}{2}x$ then the value of b_n is

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Option A:	$\frac{4}{n\pi}$
Option B:	$-\frac{4(-1)^n}{n\pi}$
Option C:	$\frac{4(-1)^n}{n\pi}$
Option D:	$-\frac{4}{n^2\pi}$
9.	Laplace inverse of $\log\left(\frac{s+2}{s-5}\right)$ is
Option A:	$\frac{1}{t}\left(e^{-2t}-e^{5t}\right)$
Option B:	$\frac{1}{t}\left(e^{5t}-e^{-2t}\right)$
Option C:	$t\left(e^{5t}-e^{-2t}\right)$
Option D:	$\frac{1}{t}\left(e^{-5t}-e^{2t}\right)$
10.	If J_n denotes the Bessel function of order n, then the value of $x J_1'$ is
Option A:	$x J_0 - J_1$
Option B:	$x J_0 - 2J_1$
Option C:	$-x J_0 + 2J_1$
Option D:	$2x J_0 - J_1$

Q2.	Solve any Four out of Six. 5 marks each
A	Find the Laplace transform of $\int_0^t t \sinh 3t \, dt$.
B	Find the Laplace inverse of $\frac{s+1}{(s+4)(s^2+1)}$.
C	Find the Fourier series expansion of $f(x)=x^2,\ -1<x<1$.

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D	Find the analytic function $u+iv$ where $u=\frac{1}{2}\log\left(x^2+y^2\right)$
E	If the position vector of a point is denoted by $\bar{r}=xi+yj+zk$ and $r=\lvert\bar{r}\rvert$ then show that $\operatorname{div}\left(r^n\,\bar{r}\right)=(n+3)\,r^n$.
F	Prove that $\bar{f}=\left(4xy+3x^2z\right)i+\left(2x^2+2z\right)j+\left(x^3+2y\right)k$ is conservative. Determine the work done by $\bar{f}$ on displacing a particle from $(1,0,1)$ to $(2,1,1)$.

Q3.	Solve any Four out of Six. **5 marks each**
A	Using Laplace transform, evaluate the integral $\int_0^\infty e^{-t}\,\frac{\sin 3t\ +\ \sin 2t}{t}\,dt$.
B	Find the Laplace inverse of $\frac{1}{\left(s^2+9\right)^2}$ using the convolution property.
C	Find the Fourier series of $f(x)=x^3,\ -\pi<x<\pi$
D	Find the analytic function $u+iv$ if $u-v=e^x(\cos y-\sin y)$
E	If $\phi=xyz$ and $\psi=xy+yz+xz$, then find $\nabla\square(\nabla\phi\times\nabla\psi)$
F	Using Gauss divergence theorem, evaluate $\iint_s 4xi+3yj-2zk\ \square\ d\bar{s}$ where S is the closed surface bounded by $x=,\ y=0,\ z=0,\ 2x+2y+z=4$.

Q4.	Solve any Four out of Six. **5 marks each**
A	Solve the equation $y''+9y=t\,;\ y(0)=-1,\ y'(0)=0$
B	Find the Laplace transform of $e^{-t}\left(1+t+t^2\right)H(t-3)$
C	Find the complex form of Fourier series of e^{2x} on $(-\pi,\pi)$
D	For a scalar function $\Phi=2xy-y^2+z^2$, find the directional derivative of

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	Φ at the point $(1,0,1)$ in the direction of vector $v = 2i + j + 2k$.
E	Show that $\int J_3(x)\,dx = J_0(x) - \frac{4}{x} J_1(x)$
F	Find the Bilinear transformation which maps $z_1 = 1,\ z_2 = i,\ z_3 = -1$ onto $w_1 = 0,\ w_2 = 1,\ w_3 = \infty$.