VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA
Odd Mid-Semester Examination for Academic Session 2025-26

COURSE NAME:BTECH
BRANCH NAME: ALL

SEMESTER:III

SUBJECT NAME: MATH-III

FULL MARKS: 30

TIME: 90 Minutes

Answer **All** Questions.

The figures in the right hand margin indicate Marks. *Symbols carry usual meaning.*

Q1. Answer all Questions. [2 × 3]

a) Find the Laplace transform of 3^t. - CO1

b) Find the Fourier coefficients a_0 and a_2 from the Fourier series expansion of $f(x)=\sin^2 x, -\pi<x<\pi$. - CO2

c) If A and B are independent events then show that A and B^c are also independent. - CO3

Q2. [4+4]

a) Find the inverse Laplace transform of $F(s)=\dfrac{1}{s^2(s^2-a^2)}$. - CO1

b) Solve the initial value problem $y''+16y=4\delta(t-\pi),\ y(0)=2, y'(0)=0$ using Laplace transform. - CO1

OR

c) Find the Laplace transform of $f(t)=\begin{cases}\sin t; & 0<t<\pi\\ t; & t>\pi\end{cases}$. - CO1

d) Solve the integral equation $y=1-\sinh t+\int_0^t (1+\tau)y(t-\tau)\,d\tau$ by using convolution. - CO1

Q3. [4+4]

a) Find the Fourier series expansion of the function $f(x)=x,\ 0<x<2\pi$. - CO2

b) Solve the following initial boundary value problem $u_{tt}=c^2u_{xx}, 0<x<1, t>0$, where $u(x,0)=x(1-x), u_t(x,0)=0, 0\le x\le 1$ and $u(0,t)=0=u(1,t), t>0$. - CO2

OR

c) Find the Fourier series expansion of the function $f(x)=\begin{cases}x, 0<x<1\\ 1-x, 1<x<2\end{cases}$ with period $P=2L=2$. - CO2

d) By using method of separation of variables solve $3u_x+2u_y=0,\ u(x,0)=4e^{-x}$. - CO2

Q4. [4+4]

a) A coin is tossed until a head appears. What is the expectation of the number of tosses required? - CO3

b) If X has the probability density $f(x)=\begin{cases}k.e^{-3x} & for\ x>0\\ 0 & elsewhere\end{cases}$. Find k and $P(0.5\le X\le 1)$. - CO3

OR

c) In a Biotechnology Department there are three sections, named as A, B and C. Section A has 15 boys and 10 girls; section B has 20 boys and 25 girls; section C has 10 boys and 20 girls. A section is chosen randomly and a student is selected. What is the probability that the student is a boy? Also find the probability that the boy is from section B. - CO3

d) Construct a cumulative distribution function for the probability density function $f(x)=kx(1-x)$ *for* $0<x<1$ and 0, otherwise. - CO3