

Seat No. **OCT-NOV 2025 WINTER EXAMINATION****11731 Bachelor of Technology (NEP-2.0)****Sub. Name: Mathematics for Electronics Engineering****Sub. Code: 114446/112436****Day and Date: Monday ,08-12-2025****Total Marks: 60****Time: 02:30 PM To 05:00 PM****Instructions: 1. All questions are compulsory****Special Inst.: Use of Non-programmable calculator is allowed.****Q1) Choose the correct alternative from the following .(Each 2 marks) [12]****a. The complete solution of $(D^3-3D^2+3D-1) y=0$ is ----- [2]**

A) $y = (c_1+c_2x+c_3x^2)e^x$ C) $y=c_1e^x + (c_2+c_3x)e^{-x}$
 B) $y = c_1e^{-x}+(c_2+c_3x)e^x$ D) $y=(c_1+c_2x)e^x+c_3e^{-2x}$

b. Value of a_0 in a Fourier series for the function $f(x) = x^2$ in the interval $(0, 2\pi)$ is ---- [2]

A) $\frac{\pi^2}{3}$ C) $\frac{2\pi^2}{3}$
 B) $\frac{4\pi^2}{3}$ D) None of these

c. If $\vec{a} = a_1\vec{i} + a_2\vec{j} + a_3\vec{k}$ the $\text{div } \vec{a}$ is----- [2]

A) $2\vec{a}$ C) a^2
 B) 0 D) \vec{a}

d. The unit vector normal to the surface $xy^3z^2=4$ at $(-1, 1, 2)$ is ----- [2]

A) $\frac{1}{\sqrt{11}}(i+3j-k)$ C) $\frac{1}{\sqrt{11}}(i-3j-k)$
 B) $\frac{1}{\sqrt{11}}(i-3j+k)$ D) $\frac{-1}{\sqrt{11}}(i+3j-k)$

e. If mean =12 & Variance=4 then the binomial constants p, q, n are --- [2]

A) $\frac{1}{2}, \frac{3}{2}, 15$ C) $\frac{2}{3}, \frac{3}{4}, 14$
 B) $\frac{2}{5}, \frac{1}{7}, 20$ D) $\frac{2}{3}, \frac{1}{3}, 18$

f.

The Laplace Transform of $e^{-2t} \cos 4t$ is -----

- A) $\frac{s-2}{(s-2)^2+16}$ C) $\frac{s+2}{(s-2)^2+16}$
 B) $\frac{s-2}{(s+2)^2+16}$ D) $\frac{s+2}{(s+2)^2+16}$

Q2) Attempt Any Two. [12]

a. Solve $(D^2-4D+4)y = 4(e^{2x} - \cos 2x)$ [6]

b. The differential equation of a circuit $R \frac{dq}{dt} + \frac{q}{C} = 40 e^{-3t} + 20 e^{-6t}$. If $R=20$ ohms, $C=0.01$ farad and $q=0$ at $t=0$, show that the minimum charge on the capacitor is 0.25 coulombs. [6]

c. Find the fourier series to represent $f(x)=x^2$ in $(0,2\pi)$ And deduce [6]

$$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$

Q3) Attempt Any Two. [12]

a. Prove that $\nabla \left(\frac{1}{r} \right) = \left(-\frac{\vec{r}}{r^3} \right)$ if $\vec{r} = xi + yj + zk$ [6]

b. If the probability that an individual suffers a bad reaction from a certain injection is 0.001, determine the probability that out of 2000 individuals
 i) Exactly 3 ii) More than two iii) At most two will suffer a bad reaction. [6]

c. Find Laplace transform of $f(t) = e^t t \sin 4t$ [6]

Q4) Attempt Any Two. [12]

a. If $\phi = x^3 + y^3 + z^3 - 3xyz$ Find i) $\vec{r} \cdot \nabla \phi$ ii) $\text{div } \vec{F}$ & $\text{curl } \vec{F}$ [6]

Where $\vec{F} = \nabla \phi$.

b. Six fair coins are tossed simultaneously. If 192 such tosses are made find the expected number of tosses showing i) one & only one heads ii) no heads iii) All heads. [6]

c. Find the Laplace transform of $\int_0^t \frac{e^{-u} \sin u}{u} du$ [6]

Q5) Attempt Any Two.

a. Find the angle between the normal to the surface $xy=z^2$ at the points (1,4,2) and (-3,-3,3). [6]

b. The life time of certain type of battery has mean life 400 hours and a standard deviation of 50 hours. Assuming the distribution of life to be normal, find [6]

i) The percentage of batteries which have life time of more than 350 hours.

ii) The percentage of batteries which have life time between 300 & 500 hours.

(Given for S.N.V. z area between $z=0$ & $z=1$ is 0.3413 and $z=0$ & $z=2$ is 0.4772).

c. Find Laplace transform of $f(t) = \left[\frac{e^{-3t} \sin 2t}{t} \right]$. [6]

End Of Question Paper

Important Note for Chief Exam Officer / SRPD Coordinator / Sr Supervisor/ Student -

This Question Paper may be distributed for following Subjects as common code.

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1] (11731) Bachelor of Technology
(NEP-2.0)

(112436) Mathematics for Electronics
Engineering

Part 2 SEM 3

2] (1154) B.Tech. CBCS (114446) Mathematics for Electronics Engineering Part 2 SEM 3