Seat No.

OCT-NOV 2025 WINTER EXAMINATION

1154 B.Tech. CBCS

Sub. Name: Engineering Mathematics - III

Sub. Code: 63460/73245/77807

Day and Date: Tuesday ,16-12-2025 **Total Marks: 70**

Time: 02:30 PM To 05:00 PM

Instructions: 1. All questions are compulsory
2. Figures to the right indicate full marks
3. Use of Scientific calculator is allowed

Q1) Choose the correct alternatives from the following.(2 marks each) **[14]**

1) The particular integral for $(D^2-2D+1)y=e^x$ is

A) $y=\frac{x^2}{2}e^x$ B) $y=\frac{x^2e^x}{2}$

C) $y=\frac{x^2e^x}{3}$ D) $y=xe^{-x}$

2) The complementary function of $(D^3-3D^2+4)y=e^{2x}$ is

A) $y=c_1e^{-x}-(c_2+c_3x)e^{2x}$ B) $y=c_1e^{-x}+(c_2-c_3x)e^{2x}$

C) $y=c_1e^{-x}+(c_2+c_3x)e^{-2x}$ D) $y=c_1e^{-x}+(c_2+c_3x)e^{2x}$

3) Unit vector in the direction normal to the surface $x^2+y^2+z^2=9$ at $(1,1,1)$ is

A) $\frac{1}{\sqrt{3}}(\bar{i}+\bar{j}+\bar{k})$ B) $\frac{1}{3}(\bar{i}-\bar{j}-2\bar{k})$

C) $\frac{1}{3}(\bar{i}+\bar{j}+\bar{k})$ D) $\frac{1}{9}(\bar{i}+2\bar{j}+2\bar{k})$

4) If $A=\left\{\frac{0.12}{5}+\frac{0.78}{6}+\frac{1}{7}\right\}$ then fuzzy set is

A) Subnormal B) Normal

C) Both A & B true D) None of these

5) If the mean of Poisson distribution is 1 then P(X = 0) is

A) 0.2124 B) 0.3986

C) 0.3679 D) None of these.

6) The Laplace transform of $\int_0^t cos2u\ du$ is

A) $\frac{2s}{s^2+4}$ B) $\frac{2}{(s^2+4)s}$

C) $\frac{4}{(s^2+4)s}$ D) $\frac{1}{s^2+4}$

7) In a Fourier cosine series for $f(x)=x^2$ value of a_0 in the interval $(0,\pi)$ is_____

A) $\frac{\pi^2}{3}$ B) $\frac{2\pi^2}{3}$

C) $\frac{\pi^2}{2}$ D) $\frac{3\pi^2}{2}$

Q2) Attempt any two of the following. **[14]**

a) Solve $(D^2+13D+36)y=e^{-4x}+sinhx$ [7]

b) Find directional derivative of $\varphi = 2x^3y - 3y^2z$ at P(1, 2, −1) in the direction of line PQ, where Q is (3,−1, 5). In what direction directional derivative maximum? Find its magnitude. [7]

c) Find α- cuts and strong α- cuts of fuzzy sets A for $\alpha = 0.2, 1, 0.8$ where

$A(x)=\frac{2x}{x+5}$, for all $x\in\{0, 1, 2, 3, 4, 5\}$ [7]

Q3) Attempt any two of the following. **[14]**

a) Solve $x^3\frac{d^3y}{dx^3} - x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 2y = x^3 + 3x$ [7]

b) Find the angle between the normals to the surface $x^2y + z = 3$ and $xlogz - y^2 + 4 = 0$ at $(-1, 2, 1)$. [7]

c) Define degree of subsethood of fuzzy sets and find S(A, B) and S(B, A) if

$A = \left\{\frac{0.3}{x_1} + \frac{0.9}{x_2} + \frac{0.7}{x_3} + \frac{0.6}{x_4} + \frac{0.1}{x_5}\right\}$ $B = \left\{\frac{0.2}{x_1} + \frac{0.4}{x_2} + \frac{0.5}{x_3} + \frac{0.7}{x_4} + \frac{0.9}{x_5}\right\}$ [7]

Q4) Attempt any two of the following. **[14]**

a) Find a Fourier series to represent $f(x) = x^2$ for $0 \le x \le 2\pi$. [7]

b) Find the Laplace transform of $\int_0^t \frac{e^{-u}sinu}{u} du$ [7]

c) Six fair coins are tossed simultaneously. If 192 such tosses are made find the expected number of tosses showing

(i) one and only one heads (ii) all heads (iii) no heads [7]

Q5) Attempt any two of the following. **[14]**

a) Find Fourier expansion of $f(x) = 4 - x^2$ in the interval (0, 2) [7]

b) Using Convolution theorem, find the inverse laplace transform of

$\frac{1}{(s-2)(s+2)^2}$ [7]

c) A random variable x has the following probability distribution [7]

x	1	2	3	4	5	6	7
P(x)	k	2k	3k	k^2	$k^2 + k$	$2k^2$	$4k^2$

Find (i) value of k (ii) P(x >5) (iii) $P(0 \le x \le 5)$

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.
सदरची प्रश्नपत्रिका खालील विषयांकरिता वितरित करता येईल.

1] (101) Bachelor of Engineering (63460) Engineering Mathematics-III Part 2 SEM 3
2] (101) Bachelor of Engineering (77807) Engineering Mathematics - III Part 2 SEM 3
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