SP-15

Total No. of Pages : 4

Seat No.	

S.Y. B.Tech. (Electronics & Telecommunication Engg.)
(Semester - III) (CBCS) Examination, January - 2024
ENGINEERING MATHEMATICS - III
Sub. Code : 73245

10652

Day and Date : Tuesday, 02- 01 - 2024 **Total Marks : 70**

Time : 10.30 a.m. to 1.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Use of non-programmable calculator is allowed.**
3) **Figures to the right indicate full marks.**

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

a) The solution for $\left(D^3+8\right)y=0$ is

i) $y=c_1e^{-2x}+e^{x}\left(c_2\cos\sqrt{3x}+c_3\sin\sqrt{3x}\right)$

ii) $y=c_1e^{-2x}+c_2e^{2x}+c_3xe^{2x}$

iii) $y=c_1e^{x}+c_2e^{2x}+c_3e^{3x}$

iv) $y=\left(c_1+c_2x+c_3x^2\right)e^{2x}$

b) The particular integral for $\left(D^2-2D+1\right)y=e^{x}$ is

i) $y=\frac{x^2}{2}e^{x}$ ii) $y=\frac{x^3e^{-x}}{2}$

iii) $y=\frac{x^3e^{-x}}{3}$ iv) $y=xe^{-x}$

10652

10652

P.T.O.

c) If $A = \left\{\frac{0.1}{5} + \frac{0.7}{6} + \frac{0.9}{7}\right\}$, $B = \left\{\frac{0.2}{5} + \frac{0.8}{6} + \frac{1}{7}\right\}$ then degree of subset hood S (A, B) =

i) 1.2 ii) 1.3

iii) 1 iv) 1.9

d) Laplace Transform of te^{-2t}

i) $\frac{1}{(s+2)^3}$ ii) $\frac{1}{(s+2)^2}$

iii) $\frac{-1}{(s-2)^2}$ iv) None of these

e) Fuzzy set A is called Normal if

i) h (A) = 0 ii) h(A) = 1

iii) h(A) < 1 iv) h(A)> 1

f) If mean of x i.e $\overline{x} = 4$ & n = 5 then probability q in binomial distribution is

i) 0.8 ii) 0.08

iii) 0.04 iv) 0.2

g) Value of b_n in a fourier series for the function $f(x) = x^2$ in the interval (–a, a) is _____.

i) a ii) π

iii) 0 iv) None of these

10652 10652 10652

Q2) Attempt any two.

a) Solve $(D^3-2D^2-5D+6)\,y = e^{3x}+8$ **[7]**

b) Find the directional derivative of $\phi = xy^2 + yz^2$ at the point (2, –1, 1) in the direction of the vector $i + 2j + 2k$. In what direction it will be maximum? Find also the magnitude of maximum directional derivative. **[7]**

c) Find the fuzzy cardinality of AUB for the fuzzy sets A(x) and B(x) given **[7]**

by $A(x) = \left\{\frac{0.1}{x_1} + \frac{0.25}{x_2} + \frac{0.2}{x_3} + \frac{0.9}{x_4} + \frac{0.35}{x_5}\right\}$,

$B(x) = \left\{\frac{0.7}{x_1} + \frac{0.5}{x_2} + \frac{0.1}{x_3} + \frac{0.95}{x_4} + \frac{0.30}{x_5}\right\}$

Q3) Attempt any two.

a) Solve $\left(D^2+2\right)y = e^x \cos x$ **[7]**

b) If $\varphi = 3x^2y - y^3z^2$ then find div $\bar{F}$ and curl $\bar{F}$ at (1, –2, –1) where $\bar{F}$ = $grad\,\varphi$ **[7]**

c) Find $\alpha-$cuts and strong $\alpha-$cuts of fuzzy sets A for α = 0.2, 1, 0.8 where $A(x) = \frac{2x}{x+5}$, for all $x \in \{0,1,2,3,4,5\}$ **[7]**

Q4) Attempt any two.

a) Find Fourier series expansion of $f(x) = \frac{1}{2}(\pi - x)$ in $(0, 2\pi)$. **[7]**

b) Find the Laplace transform of $\frac{\sin^2 t}{t}$ **[7]**

c) Assume that on an average one telephone number out of 15 called between 2 p.m. and 3 p.m. on weekdays is busy. What is the probability that if 7 randomly selected numbers are called **[7]**

i) Not more than 3

ii) Atleast three busy

Q5) Attempt any two.

a) Expand f(x) = $\begin{cases} 0, & -c < x < 0 \\ a, & 0 < x < c \end{cases}$ as a fourier series. **[7]**

b) Find the inverse laplace transform of $\frac{1}{(s-2)(s+2)^2}$ using Convolution theorem. **[7]**

c) A firm produces articles of which 0.1% are defective. It packs them in cases each contains 500 articles. If wholesaler purchases 100 such articles, how many can be expected to be free from defective and how many can be expected to have one defective? **[7]**

10652