JHARKHAND Rai University
RANCHI

End Semester/Reappear (Semester III) Examination December, 2024

Programme: B.Tech (MiE) **Full Marks: 70**
Course: Mathematics III **Time: 3 Hrs.**
Course Code: 8BSC201
Enrolment no. _____

Section I

1. **Short Answer type questions.** **4 x 5 = 20**

a. Evaluate $L^{-1}\left(\frac{2s+1}{(s-2)(s+3)}\right)$ CO1 Understand

or

Perform $\int_0^{\infty} \frac{e^{-t}sint}{t}dt = \frac{\pi}{4}$ CO1 Understand

b. Perform Fourier sine transform of $\begin{cases}1 & |x|<a \\ 0 & |x|>a\end{cases}$ CO2 Understand

or

Perform Fourier series expansion of the function CO2 Understand

$$f(x)=\begin{cases}-1 & -\pi<x<0 \\ 1 & 0<x<\pi\end{cases}$$

c. Discuss relation and function with example. CO3 Remember

or

Let X = {1, 2, 3}, Y = {a, b} and Z = {5, 6, 7}. Consider the functions f = {(1, a), (2, a), (3, b)} and g = {(a, 5), (b, 7)}. Compute f o g. CO3 Understand

d. Let V = {1, 2, 3, 4} and E = {(1, 2), (1, 4), (3, 4), (2, 3)}. Construct the graph. CO4 Understand

or

Discuss sub graph and complementary graph with example. CO4 Remember

Section II

Long Answer type questions. **3 x 10 = 30**

2. Perform Fourier sine and cosine transform of f(x) = e^{-ax}. CO2 Apply

or

Evaluate the Fourier Cosine transform of $\begin{cases}x & for\ 0<x<1/2 \\ 1-x & for\ 1/2<x<1 \\ 0 & for\ x>1\end{cases}$ CO2 Evaluate

3. Let $f: R \to R: f(x) = 4x+3\ \forall\ x \in R$. show f is invertible and find f^{-1}. CO3 Evaluate

or

If A = {x, {a}, {b, c},{ c, d, e}} compute all power set of A. CO3 Evaluate

4. Determine the value of n if CO4 Evaluate

(a) $4\ {}^{n}P_3 = {}^{n+1}P_3$ (b) ${}^{n}C_4 = {}^{n}C_3$

Or

How many 4 – digits numbers can be formed by using the digits 2, 4, 6, 8 when repetition of digits are allowed and when repetition of digits are not allowed. CO4 Evaluate

Section III

Application based questions. **1 x 20 = 20**

5. (a) Apply Laplace transform to evaluate $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t \ \ with\ x=2, \frac{dx}{dt} = -1\ at\ t=0.$ CO1 Apply

(b) Evaluate $L^{-}(log\frac{s+1}{s-1})$ CO1 Evaluate

or

(a) Evaluate $L^{-1}(\frac{5s+3}{(s-1)(s^2+2s+5)})$ CO1 Evaluate

(b) Evaluate $L\left\{t\int_0^t \frac{e^{-t}sint}{t}dt\right\}$ CO1 Evaluate

Course Outcome: On the completion of the Course, the students will be able to:

CO 1: Evaluate initial value problem and boundary value problem using Laplace Transform.
CO 2: Understand Fourier transform and its properties and will be able to solve the examples based on it. Have deep understanding to handle various types of problems using different kind of integral Transforms.
CO 3: Understand probabilities and discrete distributions for simple combinatorial processes; calculate expectations.
CO 4: Understand set operations, various types of relations and their representations, solving recurrence relations.

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