CBCS SCHEME

USN

17MATDIP41

Fourth Semester B.E. Degree Examination, Jan./Feb. 2023
Additional Mathematics - II

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Find the Rank of the Matrix $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$. (06 Marks)

b. Test for consistency and solve $x+y+z=6$, $x-y+2z=5$, $3x+y+z=8$. (07 Marks)

c. Solve the system of equations by Gauss Elimination Method
$x+y+z=9$, $x-2y+3z=8$, $2x+y-z=3$. (07 Marks)

OR

2 a. Find the Eigen values and Eigen vectors of the Matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. (06 Marks)

b. Verify Cayley – Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and find its inverse. (07 Marks)

c. Find the Rank of the Matrix $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$. (07 Marks)

Module-2

3 a. Solve $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$. (06 Marks)

b. Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 5e^{-2x}$. (07 Marks)

c. Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = \cos 2x$. (07 Marks)

OR

4 a. Solve $\frac{d^2y}{dx^2} + 4y = \sin^2 x$. (06 Marks)

b. Solve $(4D^4 - 4D^3 - 23D^2 + 12D + 36)\,y = 0$. (07 Marks)

c. Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2$. (07 Marks)

Module-3

5 a. Find the Laplace Transform of the function $\sin 5t \cos 2t$. (06 Marks)

b. Find the $L\left[\frac{\cos at - \cos bt}{t}\right]$. (07 Marks)

c. Find the Laplace Transform of the Periodic function defined by $f(t) = \frac{Kt}{T}$, $0 < t < T$, $f(t + T) = f(t)$. **(07 Marks)**

OR

6 a. Find Laplace Transform of $[(3t + 4)^3 + 5^t]$. **(06 Marks)**

b. Find L[t cos a t]. **(07 Marks)**

c. Express the following function interms of Unit step function and hence find its Laplace Transform, where

$$f(t) = \begin{cases} t , & 0 < t < 4 \\ 5 , & t > 4 \end{cases}.$$ **(07 Marks)**

Module-4

7 a. i) Find $L^{-1}\left[\frac{s}{s^2 - 16}\right]$ ii) Find $L^{-1}\left[\frac{(s+2)^3}{s^6}\right]$. **(06 Marks)**

b. Find $L^{-1}\left[\frac{2s^2 + 5s - 4}{s(s-1)(s+2)}\right]$. **(07 Marks)**

c. Find $L^{-1}\left[\frac{2s-1}{s^2 + 4s + 29}\right]$. **(07 Marks)**

OR

8 a. Find $L^{-1}\left[\frac{3}{s^2} + 2\frac{e^{-s}}{s^3} - 3\frac{e^{-2s}}{s}\right]$. **(06 Marks)**

b. Find $L^{-1}\left[\frac{3s+2}{(s-2)(s+1)}\right]$. **(07 Marks)**

c. Solve by using Laplace Transform, $\frac{d^2y}{dt^2} + k^2y = 0$, given that $y(0) = 2$, $y'(0) = 0$. **(07 Marks)**

Module-5

9 a. State and prove Addition Theorem of probability $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. **(06 Marks)**

b. The probability that an integrated circuit chip will have defective etching is 0.12. The probability that it will have a crack defect is 0.29 and the probability that it will have both defects is 0.07. What is the probability that a newly manufactured chip will have
i) an etching of crack defect? ii) neither defect? **(07 Marks)**

c. If A and B are events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$, $P(A \cap \overline{B}) = \frac{1}{3}$. Find P(A) , P(B) and $P(\overline{A} \cap B)$. **(07 Marks)**

OR

10 a. State and prove Baye's Theorem. **(06 Marks)**

b. In a certain college 4% of Men students and 1% of Women students are taller than 1.8m. Further more 60% of the students are Women. If a student is selected at random and is found taller than 1.8m, what is the probability that the student is a Women? **(07 Marks)**

c. The probability that a communication system will have high fidelity is 0.81 and the probability that it will have high fidelity and high selectivity is 0.18. Find the probability that a system will have high selectivity, given it has high fidelity. **(07 Marks)**

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