CBCS SCHEME

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15MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2024
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the rank of matrix $A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ (05 Marks)

b. Solve by Gauss elimination method:
$2x + y + 4z = 12$ $4x + 11y - z = 33$ $8x - 3y + 2z = 20$ (05 Marks)

c. Find all the eigen values of the matrix
$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ (06 Marks)

OR

2 a. Find the values of K, such that the matrix A may have the rank equal to 3:
$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 4 & K \\ 1 & 4 & 10 & K^2 \end{bmatrix}$ (05 Marks)

b. Solve by Gauss elimination method
$x_1 - 2x_2 + 3x_3 = 2$ $3x_1 - x_2 + 4x_3 = 4$ $2x_1 + x_2 - 2x_3 = 5$ (05 Marks)

c. Find all the eigen values and corresponding eigen vectors of the matrix
$A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ (06 Marks)

Module-2

3 a. Solve $(D^2 - 4D + 13)y = \cos 2x$ by the method of undetermined coefficients. (06 Marks)

b. Solve $(D^2 + 2D + 1)y = x^2 + 2x$. (05 Marks)

c. Solve $(D^2 - 6D + 25)y = \sin x$. (05 Marks)

OR

4 a. Solve $(D^2 + 1)y = \tan x$ by the method of variation of parameters. (06 Marks)

b. Solve $(D^3 + 8)y = x^4 + 2x + 1$. (05 Marks)

c. Solve $(D^2 + 2D + 5)y = e^{-x} \cos 2x$. (05 Marks)

Module-3

5 a. If $f(t) = t^2$, $0 < t < 2$ and $f(t + 2) = f(t)$ for $t > 2$, find $L[f(t)]$. (06 Marks)

b. Find $L[\cos t \cdot \cos 2t \cdot \cos 3t]$ (05 Marks)

c. Find $L[e^{-2t}(2\cos 5t - \sin 5t)]$ (05 Marks)

OR

6 a. Find $L[e^{-t}.\cos^2 3t]$ **(06 Marks)**

b. Express the following function into unit step function and hence find $L[f(t)]$ given

$$f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$$ **(05 Marks)**

c. Find $L[t.\cos at]$ **(05 Marks)**

Module-4

7 a. Find inverse Laplace transform of $\frac{s+5}{s^2 - 6s + 13}$ **(05 Marks)**

b. Find inverse Laplace transform of $\log\left[\frac{s^2+4}{s(s+4)(s-4)}\right]$ **(05 Marks)**

c. Solve by using Laplace transform method $y''(t) + 4y(t) = 0$, given that $y(0) = 2$, $y'(0) = 0$ **(06 Marks)**

OR

8 a. Find $L^{-1}\left[\frac{s^2}{(s^2+1)(s^2+4)}\right]$ **(05 Marks)**

b. Find $L^{-1}\left[\frac{(s+2)e^{-s}}{(s+1)^4}\right]$ **(05 Marks)**

c. Solve by using Laplace transform method $y''(t) + 5y' + 6y = 5e^{2x}$, $y(0) = 2$, $y'(0) = 1$. **(06 Marks)**

Module-5

9 a. State and prove Baye's theorem. **(06 Marks)**

b. A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C 3 times in 4 shots. They fire a volley. What is the probability that i) two shots hit ii) atleast two shots hit? **(05 Marks)**

c. Find P(A), P(B) and $P(A \cap \overline{B})$, if A and B are events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{5}{8}$. **(05 Marks)**

OR

10 a. Prove that $P(A \cup B) = P(A) + (B) - P(A \cap B)$, for any two events A and B. **(06 Marks)**

b. Show that the events $\overline{A}$ and $\overline{B}$ are independent, if A and B are independent events. **(05 Marks)**

c. Three machines A, B and C produce respectively 60%, 30%, 10% of the total number of items of a factory. The percentage of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C. **(05 Marks)**

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