USN ☐☐☐☐☐☐☐☐☐☐   **15MATDIP41**

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Additional Mathematics – II

Time: 3 hrs.   Max. Marks: 80

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 **a.** Find the rank of the matrix by

$$A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$$ by applying elementary row transformations. **(06 Marks)**

b. Find the inverse of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ using Caylery-Hamilton theorem. **(05 Marks)**

c. Solve the following system of equations by Gauss elimination method.
$2x + y + 4z = 12,$ $4x + 11 - z = 33,$ $8x - 3y + 2z = 20$ **(05 Marks)**

OR

2 **a.** Find the rank of the matrix $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by reducing it to echelon form. **(06 Marks)**

b. Find the eigen values of $A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$ **(05 Marks)**

c. Solve by Gauss elimination method: $x + y + z = 9,$ $x - 2y + 3z = 8,$ $2x + y - z = 3$ **(05 Marks)**

Module-2

3 **a.** Solve $\dfrac{d^3y}{dx^3} + 6\dfrac{d^2y}{dx^2} + 11\dfrac{dy}{dx} + 6y = 0$ **(05 Marks)**

b. Solve $y'' - 4y' + 13y = \cos 2x$ **(05 Marks)**

c. Solve by the method of undetermined coefficients $y'' + 3y' + 2y = 12x^2$ **(06 Marks)**

OR

4 **a.** Solve $\dfrac{d^2y}{dx^2} + 5\dfrac{dy}{dx} + 6y = e^x$ **(05 Marks)**

b. Solve $y'' + 4y' - 12y = e^{2x} - 3\sin 2x$ **(05 Marks)**

c Solve by the method of variation of parameter $\dfrac{d^2y}{dx^2} + y = \tan x$ **(06 Marks)**

Module-3

5 **a** Find the Laplace transform of
i) $e^{-2t} \sin h\, 4t$ ii) $e^{-2t}(2\cos 5t - \sin 5t)$ **(06 Marks)**

b. Find the Laplace transform of $f(t) = t^2 \quad 0 < t < 2$ and $f(t + 2) = f(t)$ for $t > 2$. **(05 Marks)**

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c. Express $f(t) = \begin{cases} t & 0 < t < 4 \\ 5 & t > 4 \end{cases}$ interms of unit step function and hence find $L[f(t)]$. **(05 Marks)**

OR

6 a. Find the Laplace transform of i) $t\cos at$ ii) $\dfrac{\cos at - \cos bt}{t}$ **(06 Marks)**

b. Given $f(t) = \begin{cases} E & 0 < t < a/2 \\ -E & a/2 < t < a \end{cases}$ where $f(t+a) = f(t)$. Show that $L[f(t)] = \dfrac{E}{S}\tan h\left(\dfrac{as}{4}\right)$. **(05 Marks)**

c. Express $f(t) = \begin{cases} 1 & 0 < t < 1 \\ t & 1 < t \le 2 \\ t^2 & t > 2 \end{cases}$ interms of unit step function and hence find $L[f(t)]$.

(05 Marks)

Module-4

7 a. Find the inverse Laplace transform of i) $\dfrac{2s-1}{s^2+4s+29}$ ii) $\dfrac{s+2}{s^2+36} + \dfrac{4s-1}{s^2+25}$ **(06 Marks)**

b. Find the inverse Laplace transform of $\log\sqrt{\dfrac{s^2+1}{s^2+4}}$ **(05 Marks)**

c. Solve by using Laplace transforms $y'' + 4y' + 4y = e^{-t}$, given that $y(0) = 0$, $y'(0) = 0$. **(05 Marks)**

OR

8 a. Find the inverse Laplace transform of $\dfrac{1}{(s+1)(s+2)(s+3)}$. **(06 Marks)**

b. Find the inverse Laplace transform of $\cot^{-1}\left(\dfrac{s+a}{b}\right)$. **(05 Marks)**

c. Using Laplace transforms solve the differential equation $y''' + 2y'' - y' - 2y = 0$ given $y(0) = y'(0) = 0$ and $y''(0) = 6$. **(05 Marks)**

Module-5

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

b. The 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)**

c. The probability that a team wins a match is 3/5. If this team play 3 matches in a tournament, what is the probability that i) win all the matches ii) lose all the matches. **(05 Marks)**

OR

10 a. If A and B are any two events of S, which are not mutually exclusive then $P(A\cup B) = P(A) + P(B) - P(A\cap B)$. **(06 Marks)**

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

c. The probability that a person A solves the problem is 1/3, that of B is 1/2 and that of C is 3/5. If the problem is simultaneously assigned to all of them what is the probability that the problem is solved? **(05 Marks)**

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