CBCS SCHEME

USN | | | | | | | | | | |

15MATDIP41

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022

Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: ***Answer 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 :

$$A = \begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}.$$
(06 Marks)

b. Show that the following system of equations is inconsistent.

$2x - 3y + 7z = 5$
$3x + y + 3z = 13$
$2x + 19y - 47z = 32.$ **(05 Marks)**

c. If the eigen values of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ are – 2, 3, 6 find the eigenvectors corresponding to each of the eigenvalue. **(05 Marks)**

OR

2 a. Computer the eigenvalues of the matrix

$$\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}.$$
(06 Marks)

b. Solve by Gauss elimination method :

$x + y + z = 9$
$2x - 3y + 4z = 13$
$3x + 4y + 5z = 40.$ **(05 Marks)**

c. Compute inverse of a matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ applying Cayley – Hamilton theorem. **(05 Marks)**

Module-2

3 a. Solve $(D^2 - 5D + 6)y = 0.$ **(06 Marks)**

b. Solve $\dfrac{d^2y}{dx^2} + 8y = \sin(3x).$ **(05 Marks)**

c. Solve by the method of undetermined coefficients the differential equation :

$$\frac{d^2y}{dx^2} + \frac{2dy}{dx} + 4y = 2x^2 + 3e^{-x}.$$
(05 Marks)

OR

4 a. Solve $\frac{d^2y}{dx^2} - \frac{3dy}{dx} + 2y = e^{4x}$. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} - \frac{4dy}{dx} + 4y = e^{2x}\cos x$. **(05 Marks)**

c. Solve by the method of variation of parameters, $\frac{d^2y}{dx^2} + 4y = \tan(2x)$. **(05 Marks)**

Module-3

5 a. Find Laplace transform of $f(t) = 6 + e^{3t} + \sin(4t) + \cos(6t) + t^4$. **(06 Marks)**

b. Find $L\left\{\int_0^t \sin(4t)dt\right\}$ applying Laplace transforms of integrals rule. **(05 Marks)**

c. If $f(t) = \begin{cases} t^2 & 0 < t < 2 \\ = t & t > 2 \end{cases}$

Express f(t) interms of unit step function and hence find the Laplace transform. **(05 Marks)**

OR

6 a. Find L.T. of :

i) $\sin(5t)\cos(2t)$ ii) $\cos^2(3t)$. **(06 Marks)**

b. Apply rule of transforms derivatives to find $L\{f'(t)\}$ for $f(t) = \cos t$ where $f'(t) \equiv$ derivative of f(t). **(05 Marks)**

c. Find the Laplace transform of the periodic function :

$$f(t) = \begin{cases} E\sin(\omega t) & 0 < t < \pi/\omega \\ = 0 & \pi/\omega < t < 2\pi/\omega \end{cases}.$$ **(05 Marks)**

Module-4

7 a. Find inverse Laplace transform :

$$\frac{1}{s^{3/2}} - \frac{2s}{s^2+64} + \frac{10}{s^2-100} + \frac{1}{s+8} + \frac{1}{s}.$$ **(06 Marks)**

b. Find :

$L^{-1}\left\{\bar{f}(s)\right\}$ if $\bar{f}(s) = \frac{1}{s(s-1)(s-2)}$. **(05 Marks)**

c. Solve using Laplace transforms :

$$\frac{dx}{dt} + 5x - 2y = t$$

$$\frac{dy}{dt} + 2x + y = 0$$

Given x = 0, y = 0 at t = 0. **(05 Marks)**

OR

8 a. Find :

$$L^{-1}\left\{\frac{3s+4}{s^2+2s+2}\right\}.$$ **(06 Marks)**

b. Find : $L^{-1}\left\{\log\sqrt{\frac{s+3}{s+4}}\right\}$. **(05 Marks)**

c. Apply Laplace transform method to solve

$y''' + 2y'' - y' - 2y = 0$

given $y(0) = y'(0) = 0$

and $y''(0) = 6$. **(05 Marks)**

Module-5

9 a. Explain the terms :

i) Probability

ii) Sample space

iii) Mutually exclusive events with an example. **(06 Marks)**

b. If three coins are thrown find the probability that,

All the three are heads

Atleast one tail occurs. **(05 Marks)**

c. If $P(A) = \frac{1}{4}$ $P(B) = \frac{1}{3}$ $P(A \cap B) = \frac{1}{12}$ find the conditional probabilities,

i) P(A/B) ii) P(B/A). **(05 Marks)**

OR

10 a. For any, two events A and B state the 'law of addition' of probabilities. Also for two independent events A and B state the 'law of multiplication' of probabilities. **(06 Marks)**

b. If three persons hit a target with probabilities $P(A) = \frac{1}{2}$ $P(B) = \frac{1}{3}$ $P(C) = \frac{1}{4}$. Find the probability that, i) All hit the target ii) Target not hit. **(05 Marks)**

c. In a bolt factory three machines A, B, C produce 20%, 30% and 50% of the total output and of their outputs 5%, 4%, 3% are defective respectively. If a bolt is chosen randomly and found defective, find the probability that bolt was manufactured by machine A. **(05 Marks)**

* * * * *