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.***

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 $\frac{d^2y}{dx^2} + 8y = \sin(3x).$ **(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 $\dfrac{d^2y}{dx^2} - \dfrac{3dy}{dx} + 2y = e^{4x}$. **(06 Marks)**

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

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

$L^{-1}\{\bar{f}(s)\}$ if $\bar{f}(s) = \dfrac{1}{s(s-1)(s-2)}$. **(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)

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