

CBCS Scheme



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15MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018 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 the matrix $A = \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ by applying elementary row transformations. (06 Marks)
- b. Solve the following system of equations by Gauss-elimination method: $x + y + z = 9$, $x - 2y + 3z = 8$ and $2x + y - z = 3$. (05 Marks)
- c. Find the inverse of the matrix $\begin{bmatrix} 5 & -2 \\ 3 & 1 \end{bmatrix}$ using Cayley-Hamilton theorem. (05 Marks)

OR

- 2 a. Find the rank of the matrix $\begin{bmatrix} 1 & 3 & -1 & 2 \\ 0 & 11 & -5 & 3 \\ 2 & -5 & 3 & 1 \\ 4 & 1 & 1 & 5 \end{bmatrix}$ by reducing it to echelon form. (06 Marks)
- b. Solve the following system of equations by Gauss-elimination method: $x + y + z = 9$, $2x - 3y + 4z = 13$ and $3x + 4y + 5z = 40$. (05 Marks)
- c. Find the eigen values of $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. (05 Marks)

Module-2

- 3 a. Solve $(D^4 - 2D^3 + 5D^2 - 8D + 4)y = 0$. (05 Marks)
- b. Solve $\frac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$. (05 Marks)
- c. Solve by the method of variation of parameters $y'' + a^2y = \sec ax$. (06 Marks)

OR

- 4 a. Solve $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 2y = e^x$. (05 Marks)
- b. Solve $(D^2 + 5D + 6)y = \sin x$. (05 Marks)
- c. Solve by the method of undetermined coefficients $y'' + 2y' + y = x^2 + 2x$ (06 Marks)

Module-3

- 5 a. Find the Laplace transform of $\cos 2t \cdot \cos 3t$. (06 Marks)
- b. Find the Laplace transform $f(t) = \frac{Kt}{T}$, $0 < t < \pi$, $f(t + T) = f(t)$. (05 Marks)



c. Express $f(t) = \begin{cases} \cos t, & 0 < t < \pi \\ \sin t, & t > \pi \end{cases}$ in terms 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) $\frac{1 - e^{-at}}{t}$. (06 Marks)

b. Find the Laplace transform of a periodic function a period $2a$, given that $f(t) = \begin{cases} t, & 0 \leq t < a \\ 2a - t, & a \leq t < 2a \end{cases}$ $f(t + 2a) = f(t)$. (05 Marks)

c. Express $f(t) = \begin{cases} 1, & 0 < t < 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2 \end{cases}$ in terms of unit step function and hence find its Laplace transform. (05 Marks)

Module-4

7 a. Find the inverse Laplace transform of (i) $\frac{(s+2)^3}{s^6}$, (ii) $\frac{s+5}{s^2 - 6s + 13}$. (06 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 transforms $\frac{d^2y}{dt^2} + k^2y = 0$, given that $y(0) = 2, y'(0) = 0$. (05 Marks)

OR

8 a. Find the inverse Laplace transform of $\frac{4s+5}{(s+1)^2(s+2)}$. (06 Marks)

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

c. Using Laplace transforms solve the differential equation $y'' + 4y' + 3y = e^{-t}$ with $y(0) = 1, y'(0) = 1$. (05 Marks)

Module-5

9 a. If A and B are any two events of S, which are not mutually exclusive then $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. (05 Marks)

b. The probability that 3 students A, B, C, solve a problem are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively. If the problem is simultaneously assigned to all of them, what is the probability that the problem is solved? (05 Marks)

c. In a class 70% are boys and 30% are girls. 5% of boys, 3% of girls are irregular to the classes. What is the probability of a student selected at random is irregular to the classes and what is the probability that the irregular student is a girl? (06 Marks)

OR

10 a. If A and B are independent events then prove that \bar{A} and \bar{B} are also independent events. (05 Marks)

b. State and prove Baye's theorem. (05 Marks)

c. A Shooter can hit a target in 3 out of 4 shots and another shooter can hit the target in 2 out of 3 shots. Find the probability that the target is being hit:

(i) when both of them try (ii) by only one shooter. (06 Marks)
