CBCS SCHEME

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15MAT41

# Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
## Engineering Mathematics - IV

Time: 3 hrs. Max. Marks: 80

**Note:** 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Use of Statistical table is allowed.*

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. Employ Taylor's Series Method to find 'y' at x = 0.2. Given the linear differential equation $\frac{dy}{dx} = 3e^x + 2y$ and y = 0 at x = 0 initially considering the terms upto the third degree. **(05 Marks)**

b. Use fourth order Runge – Kutta method to solve $(x + y)\frac{dy}{dx} = 1$, y(0.4) = 1 at x = 0.5 correct to four decimal places (Take h = 0.1). **(05 Marks)**

c. Apply Adams – Bash fourth method to solve $\frac{dy}{dx} = x^2(1 + y)$, given that y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548 and y(1.3) = 1.979 to evaluate y(1.4). **(06 Marks)**

**OR**

2 a. Given $\frac{dy}{dx} = x^2 + y$, y(0) = 1. Find correct to four decimal places y(0.1) using modified Euler's method taking h = 0.05. **(06 Marks)**

b. Use Milne's Predictor and Corrector method to compute y at x = 0.4, given $\frac{dy}{dx} = 2e^x - y$ and

| | | | | |
|---|---|---|---|---|
| x | 0 | 0.1 | 0.2 | 0.3 |
| y | 2 | 2.010 | 2.040 | 2.090 |

**(05 Marks)**

c. Use Fourth order Runge – Kutta method to fond y(1.1), given $\frac{dy}{dx} + y - 2x = 0$, y(1) = 3 with step size h = 0.1. **(05 Marks)**

### Module-2

3 a. Given $\frac{d^2y}{dx^2} - x\frac{dy}{dx} - y = 0$ with the initial conditions y(0) = 1, y'(0) = 0. Compute y(0.2) using Runge – Kutta method. **(05 Marks)**

b. Show that $J_{1/2}(1) = \sqrt{\frac{2}{\pi x}}\,\text{Sin } x$. **(05 Marks)**

c. Derive Rodrigue's formula $P_n(x) = \frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2 - 1)^n$. **(06 Marks)**

**OR**

4 a. Apply Milne's method to compute y(0.8). Given that $\frac{d^2y}{dx^2} = 2y\frac{dy}{dx}$ and the following table of initial values. (05 Marks)

| x | 0 | 0.2 | 0.4 | 0.6 |
|---|---|---|---|---|
| y | 0 | 0.2027 | 0.4228 | 0.6841 |
| y' | 1 | 1.041 | 1.179 | 1.468 |

b. Express $f(x) = x^3 + 2x^2 - 4x + 5$ interms of Legendre Polynomials. (05 Marks)

c. Show that $\int_0^1 x\,J_n(\alpha x)\,J_n(\beta x)\,dx = 0$, If $\alpha \neq \beta$. Where $\alpha$, $\beta$ are roots of $J_n(x) = 0$. (06 Marks)

## Module-3

5 a. Derive Cauchy – Riemann equations in Cartesian form. (05 Marks)

b. Using Cauchy's Residue theorem, evaluate the integral $\int_C \frac{ze^z}{z^2-1}dz$, where C is the circle $|Z| = 2$. (05 Marks)

c. Find the Bilinear transformation that transforms the points $Z_1 = 0$, $Z_2 = 1$, $Z_3 = \infty$ into the points $W_1 = -5$, $W_2 = -1$, $W_3 = 3$ respectively. (06 Marks)

**OR**

6 a. State and prove Cauchy's theorem. (05 Marks)

b. Evaluate $\int_C \frac{\sin^2 Z}{(Z-\pi/6)^3}dz$, where 'C' is the circle $|Z| = 1$, using Cauchy's integral formula. (05 Marks)

c. Construct the analytic function whose real part is $x + e^x \cos y$. (06 Marks)

## Module-4

7 a. Obtain Mean and Variance of Exponential distribution. (05 Marks)

b. Find the binomial probability distribution which has mean 2 and variance $\frac{4}{3}$. (05 Marks)

c. The Joint probabilities distribution for two Random Variations X and Y as follows :

| X \ Y | -3 | 2 | 4 |
|---|---|---|---|
| 1 | 0.1 | 0.2 | 0.2 |
| 3 | 0.3 | 0.1 | 0.1 |

Find i) Marginal distributions of X and Y ii) Co-variance of X and Y. Also verify that X and Y are independent iii) Correlation of X and Y. (06 Marks)

**OR**

8 a. A certain number of articles manufactured in one batch were classified into three categories according to a particular characteristic, being less than 50, between 50 and 60 and greater than 60. If this characteristic is known to be normally distributed, determine the mean and standard deviation for this batch if 60% , 35% and 5% were found in these categories. $[\phi(0.25) = 0.0987, \phi(1.65) = 0.4505]$. (05 Marks)

b. Obtain the mean and standard deviation of Poisson distribution. (05 Marks)

c. Define Random variable. The pdf of a variate X is given by the following table :

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| P(X) | K | 3K | 5K | 7K | 9K | 11K | 13K |

i) Find K, if this represents a valid probability distribution.

ii) Find $P(x \geq 5)$ and $P(3 < x \leq 6)$. **(06 Marks)**

## Module-5

9 a. Coins are tossed 100 times and the following results were obtained. Fit a binomial distribution for the data and test the goodness of fit [ $\Psi^2_{0.05} = 9.49$ for 4 d.f]. **(06 Marks)**

| Number of heads | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Frequency | 5 | 29 | 36 | 25 | 5 |

b. Find a Unique fixed Probability vector for the regular stochastic matrix.

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$ **(05 Marks)**

c. A group of boys and girls were given an intelligence test. The mean score. S.D score and numbers in each group are as follows :

| | Boys | Girls |
|---|---|---|
| Mean | 74 | 70 |
| SD | 8 | 10 |
| n | 12 | 10 |

Is the difference between the means of the two groups significant at 5% level of significance [$t_{.05} = 2.086$ for 20 d,f]. **(05 Marks)**

**OR**

10 a. A coin was tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased at 5% level of significance. **(05 Marks)**

b. The weight of 1500 ball bearings are normally distributed with a mean of 635 gms and S.D of 1.36 gms. If 300 random samples of size 36 are drawn from this populations. Determine the expected mean and S.D of the sampling distribution of means if sampling is done i) With replacement ii) without replacement. **(05 Marks)**

c. Every year, a man trades his car for a new car. If he has a Maruti, he trades it for an Ambassador. If he has an Ambassador, he trades it for a Santro. However, if he has a Santro, he is just as likely to trade it for a new Santro as a trade it for a Maruti or an Ambassador. In 2000 he bought his first car which was a Santro. Find the probability that he has

i) 2002 Santro ii) 2002 Maruti. **(06 Marks)**

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## Fourth Semester B.E. Degree Examination, Jan./Feb.2021
## Object Oriented Concepts

Time: 3 hrs. Max. Marks: 80

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



### Module-1

1 a. Explain features of OOPs. **(06 Marks)**
b. Define class and object with syntax of class. **(04 Marks)**
c. Define function overloading? Explain with an example. **(06 Marks)**

**OR**

2 a. Define constructor. Write a program demonstrating the use of constructors and destructor. **(06 Marks)**
b. Describe the nested classes with examples. **(04 Marks)**
c. Write C++ program to find smallest of 3 numbers. **(06 Marks)**

### Module-2

3 a. List and explain the Java Buzzwords. **(08 Marks)**
b. Discuss Bitwise and relational operators in Java. **(02 Marks)**
c. Write a Java program to find largest of 3 numbers. **(06 Marks)**

**OR**

4 a. Discuss Java's iteration statements for, while and do-while with example. **(06 Marks)**
b. Explain the concept of arrays in Java with examples. Write a Java program that creates and initializes a five integer elements array. Find the sum and average of its values. **(08 Marks)**
c. Define Bytecode. **(02 Marks)**

### Module-3

5 a. With examples, give two uses of super. **(08 Marks)**
b. Discuss about nested try statements and how such program may be executed. **(08 Marks)**

**OR**

6 a. Explain Java's built in exceptions. **(08 Marks)**
b. Write general form of interface. How interfaces can be extended and implemented. **(08 Marks)**

### Module-4

7 a. What is multithreading? Explain with an example the implementation of multithreading in java. **(08 Marks)**
b. What is the need of synchronization? Explain with an example how synchronization is implemented in java. **(08 Marks)**

**OR**

8 a. Define adapter class. Explain the significance of adapter class with example. **(08 Marks)**
b. Explain inner class with example. **(04 Marks)**
c. Explain the mechanism of Delegation Event model. **(04 Marks)**

## Module-5

9 a. What are the two types of applets? Explain the skeleton of an applet with five methods init( ), start( ), stop( ), destroy( ) and paint ( ) methods. **(08 Marks)**

b. Write syntax of APPLET tag with possible attributes and explain. **(04 Marks)**

c. Explain parameter passing to applet with an example. **(04 Marks)**

**OR**

10 a. Define Tree Write steps to create JTree. Also write a program to demonstrate the same. **(08 Marks)**

b. Explain the components and containers used in swings. **(03 Marks)**

c. Write steps to create JTable, also write a program to demonstrate the same. **(05 Marks)**

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# Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
## 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

$$A = \begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$$

by applying elementary row transformations. **(06 Marks)**

b. Solve the system of equations by Gauss-elimination method:

$x + y + z = 6$
$x - y + 2z = 5$
$3x + y + z = 8$ **(05 Marks)**

c. Find all eigen values and eigen vectors of the matrix

$A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ **(05 Marks)**

**OR**

2 a. Find all eigen values and all eigen vectors of the matrix

$$A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$$ **(06 Marks)**

b. Solve by Gauss elimination method:

$3x + y + 2z = 3$
$2x - 3y - z = -3$
$x + 2y + z = 4$ **(05 Marks)**

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

### Module-2

3 a. Solve $(D^3 - 6D^2 + 11D - 6)y = 0$ **(06 Marks)**

b. Solve $(D^2 + 6D + 9)y = 2e^{-3x}$ **(05 Marks)**

c. Solve by the method of variation of parameters $(D^2 + 1)y = \tan x$. **(05 Marks)**

**OR**

4 a. Solve $(D^3 - 5D^2 + 8D - 4)y = 0$ **(06 Marks)**

b. Solve $(D^2 - 4D + 3)y = \cos 2x$ **(05 Marks)**

c. Solve by the method of undetermined coefficients $y'' - y' - 2y = 1 - 2x$. **(05 Marks)**

## Module-3

5 a. Find Laplace transform of $\cos^3 at$. (06 Marks)

b. A periodic function of period 2a is defined by

$$f(t) = \begin{cases} E & \text{for } 0 \le t \le a \\ -E & \text{for } a \le t \le 2a \end{cases}$$ where E is a constant. Find $L\{f(t)\}$. (05 Marks)

c. Express the function $f(t) = \begin{cases} \cos t, & t \le \pi \\ \sin t, & t > \pi \end{cases}$ in terms of unit step function and hence find its Laplace transform. (05 Marks)

**OR**

6 a. Find $L\left\{\dfrac{\cos at - \cos bt}{t}\right\}$ (06 Marks)

b. Find $L\{\sin t \sin 2t \sin 3t\}$ (05 Marks)

c. Express the function $f(t) = \begin{cases} t^2, & t \le 2 \\ 4t, & t > 2 \end{cases}$ in terms of unit step function and hence find its Laplace transform. (05 Marks)

## Module-4

7 a. Find $L^{-1}\left\{\dfrac{2s+3}{s^3 - 6s^2 + 11s - 6}\right\}$ (06 Marks)

b. Find $L^{-1}\left\{\cot^{-1}\left(\dfrac{s}{a}\right)\right\}$ (05 Marks)

c. Using Laplace transform method, solve the initial value problem $y'' + 5y' + 6y = 5e^{2t}$, given that $y(0) = 2$ and $y'(0) = 1$. (05 Marks)

**OR**

8 a. Find $L^{-1}\left\{\dfrac{s+2}{s^2 - 4s + 13}\right\}$ (06 Marks)

b. Find $L^{-1}\left\{\log\left(\dfrac{s^2+1}{s(s+1)}\right)\right\}$ (05 Marks)

c. Using Laplace transforms, solve the initial value problem $y' + y = \sin t$, given that $y(0) = 0$. (05 Marks)

## Module-5

9 a. For any two events A and B, prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (06 Marks)

b. If A and B are any two events with $P(A) = \dfrac{1}{2}$, $P(B) = \dfrac{1}{3}$ and $P(A \cap B) = \dfrac{1}{4}$, find P(A/B), P(B/A), $P(\overline{A}/\overline{B})$ and $P(\overline{B}/\overline{A})$ (05 Marks)

c. From 6 positive and 8 negative numbers, 4 numbers are selected at random and are multiplied. What is the probability that the product is positive? (05 Marks)

**OR**

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

b. A book shelf contains 20 books of which 12 are on electronics and 8 are on mathematics. If 3 books are selected at random, find the probability that all the 3 books are on the same subject. (05 Marks)

c. The machines A, B, C produce 50%, 30% and 20% of the items in a factory. The percentage of defective outputs of these machines are 3, 4 and 5 respectively. If an item is selected at random is found to be defective, then determine the probability that the item was manufactured by machine A. (05 Marks)