



B000311(014)

B.Tech. (Third Semester) Examination

April-May 2023

(Civil Engg. Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) is compulsory of each question and attempt any two from (b), (c) and (d) of each questions.

Unit-I

1. (a) Find the Laplace transforms of :

4

(i) $\cos^2 2t$

(ii) $\sin^3 2t$

(b) Apply convolution theorem to evaluate :

$$L^{-1} \left\{ \frac{s}{(s^2+1)(s^2+4)(s^2+9)} \right\}$$

(c) Use transforms method to solve :

$$\frac{d^2x}{dt^2} - 2 \frac{dx}{dt} + x = e^t \text{ with } x = 2, \frac{dx}{dt} = -1 \text{ at } t = 0$$

(d) Find the inverse Laplace transform of :

$$\frac{5s+3}{(s-1)(s^2+2s+5)}$$

Unit-II

2. (a) Form the partial differential equations by eliminating the arbitrary functions from

$$f(x^2 + y^2, z - xy) = 0$$

(b) Solve :

$$(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$$

B000311(014)

(c) Solve :

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6 \frac{\partial^2 z}{\partial y^2} = \cos(2x + y)$$

Or

Solve :

$$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = \cos x \cdot \cos 2y$$

(d) Using the method of separation of variables, solve

$$\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u, \text{ where, } u(x, 0) = 6e^{-3x}$$

Unit-III

3. (a) The probability density function of a variate X is :

X	:	0	1	2	3	4	5	6
$P(X)$	:	k	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$

What will be the minimum value of k so that

$$P(X \leq 2) > 3$$

B000311(014)

PTO

(b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution.

8

(c) The following data are the number of seeds germinating out of 10 on damp filter paper for 80 sets of seeds. Fit a binomial distribution to these data :

8

x :	0	1	2	3	4	5	6	7	8	9	10
f :	6	20	28	12	8	6	0	0	0	0	0

(d) Fit a Poisson distribution to the set of observation:

8

X	0	1	2	3	4
$F(X)$	122	60	15	2	1

Unit-IV

4. (a) Using Lagrange's interpolation formula, find $y(10)$ from the following table :

4

x :	5	6	9	11
y :	12	13	14	16

(b) Given the following table, find $y(35)$, by using Stirling's formula and Bessel's formula.

8

x :	20	30	40	50
y :	512	439	346	243

(c) The population of a town is as follows :

8

Year	x :	1941	1951	1961	1971	1981	1991
Population in lakhs	y :	20	24	29	36	46	51

(d) From the following table find $f(x)$ and hence $f(6)$ using Newton's Divided Difference interpolation formula :

8

x :	1	2	7	8
$f(x)$:	1	5	5	4

Unit-V

5. (a) (i) Write the formulas for fourth order Runge-Kutta method.

2

(ii) Write the formula for Adams-Bashforth method.

2

(b) Solve the equation $\frac{dy}{dx} = 1 - y$, given $y(0) = 0$, using

Modified Euler's method and tabulate the solutions at $x = 0.1, 0.2$ and 0.3 .

8

- (c) Using Runge-Kutta method of fourth order, find $y(0.8)$ correct to 4 decimal places if :

8

$$\frac{dy}{dx} = y - x^2, y(0.6) = 1.7379$$

- (d) Using Adams-Bashforth method, find $y(0.4)$ given

8

$$\frac{dy}{dx} = \frac{1}{2}xy, y(0.1) = 1.01,$$

$$y(0.2) = 1.022, y(0.3) = 1.023$$

Or

Using Milne's method, find $y(4.4)$ given

$$5xy' + y^2 - 2 = 0 \text{ and } y(4) = 1, y(4.1) = 1.0049,$$

$$y(4.2) = 1.0097 \text{ and } y(4.3) = 1.0143.$$