

12035

21314

3 Hours / 100 Marks

Seat No.

--	--	--	--	--	--	--	--

- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Solve any TEN of the following:

20

a) Evaluate: $\int \frac{dx}{\sqrt{x} - \sqrt{x-1}}$

b) Evaluate: $\int \left(\log_a a + e^{2\log_e x} - e^{x \cdot \log_e a} \right) dx$

c) Evaluate: $\int \frac{dx}{9x^2 + 25}$

P.T.O.

d) Evaluate: $\int_0^{\infty} e^{-x} dx$

e) Evaluate: $\int_1^2 \frac{dx}{3x-2}$

f) Find order and degree of a differential equation

$$\sqrt[3]{\frac{d^2y}{dx^2}} = \sqrt[4]{\frac{d^3y}{dx^3}}$$

g) Form a differential equation by eliminating arbitrary constant from $y^2 = 4ax$.

h) Find the area under the curve $y = x^3$ from $x = 0$ to $x = 3$ with x -axis.

i) Three fair coins are tossed. Find the probability that at least two heads appears.

j) From 20 tickets marked 1 to 20. one ticket is drawn at random. Find the probability that it is marked with multiple of 3 or 5.

k) If two dice are thrown. Find the probability that the total score obtained is a prime number.

l) Two cards are drawn from a well shuffled pack of 52 cards. What is probability that both are king?

2. Solve any **FOUR** of the following:

16

a) Evaluate: $\int \frac{\sec x \cdot \operatorname{cosec} x}{\log (\tan x)} dx$

b) Evaluate: $\int x^2 e^{3x} dx$

c) Evaluate: $\int \frac{dx}{\cos^2 x (1 - \tan x) (2 + \tan x)}$

d) Evaluate: $\int_0^{\pi} \frac{dx}{5 + 4 \cos x}$

e) Find area enclosed by two parabola $y^2 = x$ and $x^2 = y$.

f) Find the C.G. of the area under the parabola $y = 4ax^2$ from $x = 0$ to $x = c$.

3. Solve any **FOUR** of the following:

16

a) Evaluate: $\int_0^{\pi/2} \frac{dx}{1 + \sqrt[n]{\cot x}}$

b) Evaluate: $\int_0^{\pi/2} \frac{dx}{a^2 \cos^2 x + b^2 \sin^2 x}$

- c) Evaluate: $\int_0^{\pi/4} \log(1 + \tan x) dx$
- d) Find area of circle $x^2 + y^2 = 25$ using integration.
- e) Find the volume generated by revolving about X-axis the area bounded by $4y = 3x$, $y = 0$ and line $x = 4$.
- f) Verify that $y = ax^2 + b$ is a solution of a differential equation
- $$x \frac{d^2 y}{dx^2} - \frac{dy}{dx} = 0.$$

4. Solve any **FOUR** of the following:

16

- a) Solve: $\frac{dy}{dx} = e^{3x-2y} + x^2 e^{-2y}$.
- b) Solve: $x^2 y dx - (x^3 + y^3) dy = 0$.
- c) Solve: $(2xy + y^2) dx + (x^2 + 2xy + \sin y) dy = 0$.
- d) Solve: $x \frac{dy}{dx} - y = x^2 \cdot \cos^2 x$.
- e) Solve by Gauss elimination method.
- $$x + y + z = 6, \quad 3x - y + 3z = 10, \quad 5x + 5y + 4z = 3.$$
- f) Solve by Jacobi's Method.
- $$5x + 2y + z = 12, \quad x + 4y + 2z = 15, \quad x + 2y + 5z = 20.$$

5. Solve any FOUR of the following:**16**

- a) Solve: $\cos x \frac{dy}{dx} + y \cdot \sin x = y^4 \sin 2x$
- b) A particle is moving in a straight line according to the law of motion. $x = 2 \cos 2t + 3 \sin 2t - 5$. Prove that it executes S.H.M. Find its centre and period.
- c) A particle starts from rest its acceleration at any time is $(t + 3)m/3^2$. Find distance travelled by the particle in 4 seconds.
- d) Evaluate: $\sqrt[3]{100}$ using Newton Raphson method. (Three iteration)
- e) Find root of equation $x^3 - x - 1 = 0$ using Regula Falsi Method. (Three iteration)
- f) Solve the following equation by Gauss Seidal method.
 $10x + y + z = 12, \quad x + 10y + z = 12, \quad x + y + 10z = 12.$

6. Solve any FOUR of the following:**16**

- a) Find the approximate root of $x^3 - x - 4 = 0$ using Bisection method. (Three iteration)
- b) In a college hostel there are 75 students out of which 15 students like to drink tea, 40 likes to drink coffee and 20 neither coffee nor tea. Two students from this hostel come to a canteen. Find the probability that both will order the same drink.
- c) Five men in a company of 20 are graduates if 3 men are picked up out of 20 at random. What is the probability that:
- They are all graduate
 - Atleast one is graduate.

- d) If the chance that out of 10 telephone lines. One of the line is busy at any instant is 0.2.
- What is the chance that 5 of the lines are busy?
 - What is the most probable number of busy line and what is the probability of this number?
- e) If the probability of bad reaction from a certain injection is 0.001., Determine the chance that out of 2000 individuals more than two will get a bad reaction.
- f) In a sample of 1000 cases, the mean of test is 14 and standard deviation is 2.5
Assuming distribution is to be normal. Find:
- How many students score between 12 and 15?
 - How many students score above 18 given?

$$A(0.8) = 0.2881$$

$$A(1.6) = 0.4452$$

$$A(0.4) = 0.1554$$
