

M-2

312301  
Sum - 2024

23242

3 Hours / 70 Marks

Seat No.

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- 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 FIVE of the following: 10
- a) Evaluate :  $\int \left( \frac{1}{1+x^2} + 5^x \right) dx$
  - b) Evaluate :  $\int \tan^2 x \ dx$
  - c) Evaluate :  $\int_1^2 \frac{dx}{2x+11}$
  - d) Find the order and degree of the following differential equation.  
$$\frac{d^2y}{dx^2} = \sqrt{1 + \left( \frac{dy}{dx} \right)^2}$$
  - e) Show that there exist a root of the equation  $x^2 - 2x - 1 = 0$  in  $(-1, 0)$

P.T.O.

~~f) Use~~ f) Find the approximate value of  $\sqrt{26}$  by using Bakhshali iterative method.

g) If ten fair coins are tossed. What is the probability that there are exactly 3 heads?

2. Solve any THREE of the following:

12

a) Evaluate :  $\int \frac{dx}{2x + x \log x}$

b) Evaluate :  $\int \frac{\sec^2 x}{(1 + \tan x)(2 + \tan x)} dx$

c) Evaluate :  $\int x \cdot \tan^{-1} x \, dx$

d) Evaluate :  $\int \frac{dx}{2x^2 + 3x + 1}$

3. Solve any THREE of the following:

12

a) Evaluate :  $\int \frac{dx}{4\cos^2 x + 9\sin^2 x}$

b) Evaluate :  $\int_0^5 \frac{\sqrt{9-x}}{\sqrt{9-x} + \sqrt{x+4}} \, dx$

c) Solve :

$$(3x^2 + 6xy^2)dx + (6x^2y + 4y^2)dy = 0$$

d) Find real root of the equation  $x^3 - 2x - 5 = 0$  by bisection method (Three iterations only).

4. Solve any THREE of the following:

12

- a) Using Newton Raphson Method, find the approximate value of  $\sqrt[3]{100}$  (3 iterations)
- b) Find the root of equation  $x^3 - 9x + 1 = 0$  which lies between 2 and 3 using Regular Falsi Method.
- c) Solve the following equations by Gauss Seidal method.  
 $10x + y + z = 12, \quad 2x + 10y + z = 13, \quad 2x + 2y + 10z = 14$
- d) The probability that a pen manufactured by a company will be defective is  $\frac{1}{10}$ . If 12 such pens are manufactured. Find the probability that.
- i) Exactly two will be defective
  - ii) At least two will be defective
- e) If 5% of the electric bulbs manufactured by a company are defective. Use Poisson's distribution to find the probability that in a sample of 100 bulbs.
- i) None is defective.
  - ii) Five bulbs are defective. (Given  $e^{-5} = 0.007$ )

5. Solve any TWO of the following:

12

- a) i) Evaluate :  $\int \frac{dx}{5+4\cos x}$
- ii) Evaluate :  $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$
- b) i) Evaluate :  $\int_0^{\pi/2} \frac{\sin x}{(1+\cos x)^2} dx$
- ii) Evaluate :  $\int_0^4 \frac{dx}{\sqrt{4x-x^2}}$

c) i) Evaluate :  $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

ii) Evaluate :  $\int_4^5 \frac{\sqrt{5-x}}{\sqrt{x-4} + \sqrt{5-x}} dx$

**6.** Solve any TWO of the following:

**12**

a) i) Form a differential equation

$$y = Ae^x + Be^{-x}$$

ii) Solve :

$$\frac{dy}{dx} = e^{3x-2y} + x^2 e^{-2y}$$

b) i) Solve :  $\frac{dy}{dx} + y \cot x = \operatorname{cosec} x$

ii) Find particular solution of D.E

$$\frac{dy}{dx} = 6 - 3x, \text{ given at } x = 0, y = 0$$

c) In a certain examination 500 students appeared. Mean score is 68 and S.D. is 8 Assuming data are normally distributed find the number of student scoring.

i) less than 50

ii) more than 60

[Given : A (2.25) = 0.4878

$$A(1) = 0.3413]$$