

312301

24225

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 : $\int \sqrt{1 + \cos 2x} \, dx$

b) Evaluate : $\int \left(\frac{1}{\sqrt{1-x^2}} - \cos x \right) dx$

c) Evaluate : $\int_2^4 \frac{dx}{2x+3}$

d) Find the order and degree of differential equation

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

e) Find the approximate root of $x^3 - x - 1 = 0$ by using Bisection method. (One Iteration only)

P.T.O.

- f) Show that the root of $x^3 - 4x - 9 = 0$ lies in the interval (2, 3)
- g) An unbiased coin tossed 5 times. Find the probability of getting three heads.

2. Solve any THREE of the following:

12

- a) Evaluate : $\int \frac{e^x(x+1)}{\cos(x.e^x)} dx$
- b) Evaluate : $\int \frac{1}{x^2 + 3x + 2} dx$
- c) Evaluate : $\int \frac{dx}{5 - 4 \cos x}$
- d) Evaluate : $\int \frac{e^x}{(e^x - 1)(e^x + 1)} dx$

3. Solve any THREE of the following:

12

- a) Evaluate : $\int \tan^{-1}x dx$
- b) Evaluate : $\int_0^{\pi/2} \frac{\cos x}{\cos x + \sin x} dx$
- c) Form a differential equation if $y = Ae^{2x} + Be^{-2x}$.
- d) Using Newton Raphson Method. Find approximate root of the equation $x^3 - 4x + 1 = 0$ (Three iterations only)

4. Solve any THREE of the following:**12**

- a) Find the root of the equation $x^3 - 6x + 3 = 0$ using Bisection Method (Three iterations only)
- b) Solve the following equation by Jacobi's iteration Method
 $10x + y + 2z = 13$, $3x + 10y + z = 14$, $2x + 3y + 10z = 15$
- c) Solve the following system of equation by Gauss-seidal Method $20x - y + 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$.
- d) If 20% of the bolts produced by a machine are defective. Find the probability that out of 4 bolts drawn
 - i) One is defective
 - ii) At most two are defective
- e) If a random variable has a poisson distribution such that $P(2) = P(3)$ Find $P(5)$.

5. Solve any TWO of the following:**12**

- a) i) Evaluate : $\int \frac{dx}{3 - 2\sin^2 x}$
ii) Evaluate : $\int \frac{(x+1)}{(x-1)^2} dx$
- b) i) Evaluate : $\int_2^5 \frac{\sqrt{x}}{\sqrt{7-x} + \sqrt{x}} dx$
ii) Evaluate : $\int_0^4 \frac{\sqrt[3]{x+5}}{\sqrt[3]{x+5} + \sqrt[3]{9-x}} dx$
- c) i) Evaluate : $\int_0^{\pi/2} \log(\tan x) dx$
ii) Evaluate : $\int_0^{\pi/2} \sin x \cdot \cos x dx$

6. Solve any TWO of the following:

- a) i) Solve : $(1 + x^2) dy - (1 + y^2) dx = 0$
- ii) Solve : $(x^2 + 6xy - y^2) dx + (3x^2 - 2xy + y^2) dy = 0$
- b) i) Solve : $\frac{dy}{dx} + y \tan x = \cos^2 x$
- ii) Verify that $y = \cos x$ is a solution of $\frac{d^2y}{dx^2} + y = 0$
- c) A factory manufactured 2000 electric bulbs with average life 2040 hours and S.D. of 60 hours. Assuming normal distribution find number of bulbs having life.
- i) more than 2150 hours.
- ii) less than 1960 hours.

Given $A(1.83) = 0.4667$

$A(1.33) = 0.4082$
