22210

11920

3 Hours / 70 Marks Seat No.

Instructions – (1) All Questions are *Compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following: **10**

a) If $f(x) = tan\ x$, show that

$$f(2x) = \frac{2f(x)}{1 - [f(x)]^2}$$

b) State whether the function $f(x) = \dfrac{e^x + e^{-x}}{2}$ is even or odd.

c) Find $\dfrac{dy}{dx}$ if $y = x.e^x$

d) Evaluate $\int tan^{-1}x\ dx$

e) Evaluate $\int \sqrt{1 + sin2x}\ dx$

f) Find the area bounded by the curve $y = sin\ x$ and the x-axis from $x = 0$ to $x = \pi$

g) Express in the form $a + ib$,

$Z = \dfrac{1 + i}{2 - i}$, where $a,\ b,\ \in$IR. $i = \sqrt{-1}$

Marks

2. **Attempt any THREE of the following:** **12**

a) If $x = a(\theta - \sin\theta)$, $y = a(1 - \cos \theta)$

find $\dfrac{dy}{dx}$

b) If $x^2 + y^2 = xy$ find $\dfrac{dy}{dx}$

c) A metal wire 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.

d) A beam is bent in the form of the curve $y = 2 \sin x - \sin 2x$. Find the radius of curvature of the beam at this point at $x = \dfrac{\pi}{2}$

3. **Attempt any THREE of the following:** **12**

a) Find the equation of the tangent and normal to the curve $4x^2 + 9y^2 = 40$ at (1,2)

b) Find $\dfrac{dy}{dx}$ if $y = x^{\sin x} + (\tan x)^x$

c) Find $\dfrac{dy}{dx}$ if $y = \log \left[x + \sqrt{x^2 + a^2} \right]$

d) Evaluate $\displaystyle\int \dfrac{dx}{4 + 5\cos x}$

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

a) Evaluate $\displaystyle\int \dfrac{(x - 1)e^x}{x^2 . \sin^2 \left(\dfrac{e^x}{x} \right)} \, dx$

b) Evaluate $\displaystyle\int \sin^3 x \, dx$

c) Evaluate $\displaystyle\int \dfrac{2x^2 + 5}{(x - 1)(x + 2)(x + 3)} \, dx$

d) Evaluate $\displaystyle\int x^2 . e^{3x} \, dx$

e) Evalute $\displaystyle\int_{o}^{5} \dfrac{\sqrt{5 - x}}{\sqrt{x} + \sqrt{5 - x}} \, dx$

Marks

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

a) Find the area of the circle $x^2 + y^2 = 36$ by using definite integration.

b) (i) Find the order and degree of D.E.

$$\sqrt{\frac{d^2y}{dx^2}} - \frac{dy}{dx} - xy^2 = 0$$

(ii) Solve D. E. $x \cdot \frac{dy}{dx} + y = x^3$

c) The velocity of a particle is given by $v = t^2 - 6t + 7$. Find distance covered in 3 seconds.

6. **Attempt any TWO of the following:** 12

a) i) Express in polar form, $Z = 1 + i\sqrt{3}$

ii) Find $L \{sin\ 3t + cos\ 2t\}$

b) Find $L^{-1} \left\{ \frac{2s + 3}{(s + 2)(s + 6)} \right\}$

c) Solve the differential equation using Lap lace Transformation.

$\frac{dy}{dt} - 3y = t.e^{-2t},\ y(0) = 0$

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