

## SECTION-II

Q-4-A] Multiple choice question (2M each) [6M]

(i) Find order and degree of the differential equation

$$\left[1 + \left(\frac{dy}{dx}\right)^3\right]^{3/4} = 7 \frac{d^2y}{dx^2} \text{ respectively :-}$$

- (a) 3, 2 (b) 2, 3 (c) 2, 9 (d) 3, 9

(ii)  $\int \frac{\sin 2x}{1 + \sin^2 x} dx =$

- (a)  $\frac{\cos 2x + c}{2}$  (b)  $\frac{\sin 2x + c}{2}$  (c)  $2 \sin 2x + c$

(d)  $\log |1 + \sin^2 x| + c$

(iii) Find integrating factor of  $\cos^2 x \frac{dy}{dx} + y = \tan x$

- (a)  $\sec^2 x$  (b)  $e^{\sec^2 x}$  (c)  $e^{\tan x}$  (d)  $\tan x$

Q(B) Attempt Any 3/5 (2M each) [6M]

i] Given  $X \sim B(n, p)$ , If  $n=100$ ,  $E(X)=50$  then

find  $\text{Var}(X)$  and  $\text{S.D.}(X)$ .

i)  $x = \cos(\log t)$ ,  $y = \log(\sin t)$

find  $\frac{dy}{dx}$

ii) Find the equation of tangent to the curve  $y = 3x^2 - x + 1$  at  $P(2, 1)$

iv)  $\int \sec^n x \cdot \tan x \, dx$ , Evaluate

v)  $\int_0^{\pi/2} \frac{\sin^3 x}{\sin^3 x + \cos^3 x} \, dx$ , Evaluate

Q.5.A) Attempt any 2/3 (3M each) [6M]

i) Find  $\alpha$  and  $\beta$ , so that the function  $f(x)$  defined by

$$f(x) = -2\sin x \quad \text{for } -\pi \leq x \leq -\frac{\pi}{2}$$

$$= \alpha \sin x + \beta \quad -\frac{\pi}{2} < x < \frac{\pi}{2}$$

$$= \cos x \quad \frac{\pi}{2} \leq x \leq \pi$$

is continuous on  $[-\pi, \pi]$

ii) If  $x^m y^n = (x+y)^{m+n}$  then find  $\frac{dy}{dx}$

iii) A fair coin is tossed 8 times. Find the probability that it shows tails at least once.

B) Attempt any 2/3 (4m each) [8m]

i)  $\int \sqrt{a^2 - x^2} dx = \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \left( \frac{x}{a} \right) + c$

ii) Solve the following differential equation

$$\frac{dy}{dx} = y + \frac{\sqrt{x^2 + y^2}}{x}$$

iii) A r.v. X has the following probability distribution

X	-2	-1	0	1	2	3
P(X=x)	0.1	K	0.2	2K	0.3	K

Find the value of k and calculate mean and variance of X.

Q6A) Attempt any 2/3 (3m each) [6M]

i) If  $x = f(t)$ ,  $y = g(t)$  are differentiable functions of parameter 't' then prove that y is a differentiable function of 'x' and

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} \quad \text{where } \frac{dx}{dt} \neq 0$$



ii) Evaluate  $\int [\sin(\log x) + \cos(\log x)] dx$

iii)  $f(x) = \frac{\sqrt{3} - \tan x}{\pi - 3x}$  for  $x \neq \pi/3$   
 $= K$  for  $x = \pi/3$  at  $x = \frac{\pi}{3}$

B) Attempt any 2/3 (4M each) [8M]

- i) An open box is to be made out of a piece of square card board side of 10cm by cutting off equal squares from the corners and turning up the sides. Find the maximum volume of the box.
- ii) Find the area enclosed between the circle  $x^2 + y^2 = 16$  and the parabola  $y^2 = 6x$
- iii) Evaluate  $\int_0^{\pi/2} \log(\cos x) dx$



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