

- 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) Preferably, write the answers in sequential order.

1. Attempt any **TEN** of the following :

[20]

- (a) Find the gradient of the tangent of the curve  $y = \sqrt{x^3}$  at  $x = 4$ .  
(b) Find the point on the curve  $y = 2x^2 - 6x$  where the tangent is parallel to the  $x$  - axis.  
(c) Evaluate:  $\int (\tan x + \cot x)^2 dx$   
(d) Evaluate  $\int \frac{e^x}{e^{2x} - 16} dx$   
(e) Evaluate:  $\int xe^x dx$   
(f) Evaluate  $\int \log x \cdot dx$   
(g) Evaluate :  $\int_1^2 \frac{dx}{3x-2}$   
(h) Find the area enclosed by  $y = 2x + x^2$  (above the  $x$ -axis) and  $x = 1$  and  $x = 3$ .  
(i) Find the order and degree of the equation  $2 \frac{d^2y}{dx^2} + \left( 3\sqrt{1 - \left(\frac{dy}{dx}\right)^2} - y \right) = 0$ .  
(j) If the coin is tossed three times then find the probability of getting exactly two tails.  
(k) A bag contains 7 white balls, 5 black balls and 4 red balls. If two balls are drawn at random from the bag. Find the probability that both the balls are white.  
(l) Two cards are drawn at random from a well shuffled pack of 52 cards. Find the probability that the two cards drawn are a king and a queen of the same suit.

2. Attempt any **FOUR** of the following.

[16]

- (a) Find the equation of tangent and normal to the curve  $4x^2 + 9y^2 = 40$  at point (1,2).  
(b) Find the maximum and minimum value of  $y = x^3 - 18x^2 - 96x$ .  
(c) A metal wire 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.  
(d) Evaluate  $\int \frac{1 + \tan^2 x}{1 - \tan^2 x} dx$   
(e) Evaluate:  $\int \frac{1}{x[9 + (\log x)^2]} dx$   
(f) Evaluate  $\int \frac{(1 + \sqrt{x})^2}{\sqrt{x}} dx$

3. Attempt any **FOUR** of the following.

[16]

- (a) Evaluate  $\int_0^{\pi/4} x \sec^2 x dx$   
(b) Evaluate  $\int \sin(\log x) dx$   
(c) Find the area bounded by the curve  $y = x^2$  and line  $y = x$ .  
(d) Evaluate  $\int_0^1 x \cdot \tan^{-1} x \cdot dx$

(e) Solve:  $\frac{dy}{dx} = \frac{y}{x} + \sin \frac{y}{x}$ .

(f) Obtain the differential equation if  $y = A \cdot \cos(\log x) + B \cdot \sin(\log x)$ .

4. Attempt any **FOUR** of the following.

[16]

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

(b) Evaluate  $\int_2^5 \frac{\sqrt{x}}{\sqrt{7-x} + \sqrt{x}} dx$

(c) Find by integration the area of the circle  $x^2 + y^2 = a^2$ .

(d) Evaluate  $\frac{dy}{dx} = e^{2x-3y} + 4x^2e^{-3y}$

(e) Solve  $(2xy + y^2) dx + (x^2 + 2xy + \sin y) dy = 0$ .

(f) Find the area bounded by  $y^2 = 2x$  and  $x - y = 4$ .

5. Attempt any **FOUR** of the following.

[16]

(a) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is  $\frac{1}{7}$  and that of wife selection is  $\frac{1}{5}$ . What is the probability that : (1) Both of them will be selected, (2) None of them will be selected.

(b) Solve  $\frac{dy}{dx} = \cos(x + y)$

(c) A skilled typist, on routine work, kept a record of mistakes per day during 300 working days. Fit a Poission distribution to the set of observations.

<b>x</b>	0	1	2	3	4	5	6
<b>y</b>	143	90	42	12	9	3	1

(d) Solve  $(4x^3y^2 + y \cdot \cos xy)dx + (2x^4y + x \cdot \cos xy)dy = 0$

(e) Evaluate :  $\int_0^1 x(1-x)^{3/2} dx$ .

(f) If the probability of a 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.  
(Given  $e^2 = 7.4$ )

6. Attempt any **FOUR** of the following.

[16]

(a) A coin is tossed and a die is rolled. Show that the events head and six are independent and mutually exclusive.

(b) If two dice are rolled simultaneously then find the probability that total is 6 or 10.

(c) In a sample of 1000 cases the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal.

Find: (i) How many students score between 12 and 15?

(ii) How many students score above 18?

(d) The probability that a man aged 65 will live to 75 is 0.65. What is the probability that out of 10 men which are now 65, 7 will live to 75?

(e) Divide 80 into two parts such that their product is maximum.

(f) A problem is given to three students A, B, C whose chances of solving it are  $\frac{1}{2}, \frac{3}{4}$  and  $\frac{1}{4}$  respectively. What is the change (chance) that the problem is solved?

**Paper Discussion Schedule for SY Diploma (Sem. III) – Maths III**

Date	Day	Timing	Centres
13 Nov. 2016	Sunday	9 a.m. to 11 a.m.	Dadar, Andheri, Borivali, Ghatkoper & Thane
13 Nov. 2016	Sunday	12 p.m. to 2 p.m.	Chembur & Nerul

