O.S.D.A.V. Public School, Kaithal.
Pre Board Exam. 2024-2025
Class : XII
Subject: Mathematics (Applied) **Set-A**

Time 3 hrs. **M.M. 80**

General Instructions:

1. This question paper contains **five sections** A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions
2. **Section A** has **18 MCQ's** and **02 Assertion-Reason based** questions of 1 mark each.
3. **Section B** has **5 Very Short Answer (VSA)-type** questions of 2 marks each.
4. **Section C has 6 Short Answer (SA)-type** questions of 3 marks each.
5. **Section D has 4 Long Answer (LA)-type** questions of 5 marks each.

Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

Section A

1. A car run 45m while B runs 50m. In a kilometer race, B beats A by:

   a. 150m b. 120m c. 900m d. 100m

2. If x > y and z < o then:

   a. xz > yz b. xz ≥ yz c. $\frac{x}{z} > \frac{y}{z}$ d. $\frac{x}{z} < \frac{y}{z}$

3. If AB = A and BA = B then (B^2 + B) equals to:

   a. 2A b. 0 c. 2I d. 2B

4. If A = $\begin{bmatrix} 2 & \lambda & -3 \\ 0 & 2 & 5 \\ a & 1 & 3 \end{bmatrix}$ then A^{-1} exist. if:

   a. $\lambda \neq \frac{-8}{5}$ b. $\lambda \neq 2$ c. $\lambda \neq -2$ d. None of these

5. If $x = at^2$, y = at, then $\frac{d^2y}{dx^2}$ is equal to:

   a. $\frac{-1}{4at^3}$ b. $\frac{1}{4at^3}$ c. $\frac{-1}{at^3}$ d. $\frac{1}{at^3}$

6. The interval in which the function $f(x) = 6 - 9x - x^2$ is increasing is:

   a. $(-\infty, \infty)$ b. $(-\infty, -\frac{9}{2}]$ c. $[-\frac{9}{2}, \infty)$ d. None of these

7. A box contains 100 blubs, out of which 10 are defective. A sample of 5 blubs is drawn. The probability that none is defective is:

   a. $\frac{9}{10}$ b. $(\frac{1}{10})^5$ c. $(\frac{9}{10})^5$ d. $(\frac{1}{2})^5$

8. The sum of the order and degree of the differential equation: = $\frac{d}{dx}\left\{\left(\frac{dy}{dx}\right)^3\right\}$

a. 3 b. 4 c. 2 d. 1

9. The mean of t-distribution is:

a. 0 b. 1 c. 2 d. none defined

10. For the given values 15, 23, 28, 36, 41, 46, the three yearly moving averages are:

a. 24, 29, 35, 41 b. 22, 28, 35, 41 c. 22, 29, 35, 41 d. 24, 28, 35, 41

11. The present value of a perpetuity payable at the end of each payment period is given by:

a. Ri b. R + $\frac{R}{i}$ c. $\frac{R}{i}$ d. R – Ri

12. Objective function of a L.P.P. is:

a. a relation between two variables b. a constant

c. a function to be optimised d. none of these.

13. (48 x 39)mod5 is equal to:

a. 2 b. 1 c. 5 d. 4

14. Ravi can row upstream 8 km/h and downstream 116km/h. The rate of current is:

a. 2km/h b. 3km/h c. 4km/h d. 5km/h

15. The solution set of $-4 < 3 + 2x \leq 11$, $x \in R$ is:

a. [-2, 3] b. (-2, 3] c. [-3, 3) d. (-3, 3]

16. If A = $\begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then the value of |3A| is:

a. -54 b. -18 c. 54 d. 18

17. $\int_0^{40} \frac{dx}{2x+1}$ = logk, then the value of k is:

a. $\frac{1}{2}$ b. 3 c. $\frac{9}{2}$ d. 9

18. The integrating factor of the differential equation $x\frac{dy}{dx}$ - y = $2x^2$ is

a. $\frac{-1}{x}$ b. $\frac{1}{x}$ c. $\frac{1}{x^2}$ d. log x

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

19. Assertion (A): A machine costing Rs. 40000 has a final scrap value of Rs. 10000. If the annual depreciation is Rs. 5000, then the estimated useful life of the machine is 6.

Reason (R): The value of depreciable assets at the end of its useful life is called the scrap value.

20. In a binomial distribution n = 200 and p = 0.04. Taking poison distribution as an approximation to the binomial distribution.

Assertion (A) : Mean of poison distribution = 8

Reason (R): P (X = 4) = $\frac{512}{3e^8}$

Section B

21. If A = $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then find f(A), where f(x)= $x^2 - 5x + 7$

or

Find the value of x such that:

$$[1 \quad x \quad 1] \begin{bmatrix} 1 & 3 & 3 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$$

22. Solve the following system of equations using Cramer's rule:

$3x - 4y = 1$

$-2x + 5y = -3$

23. Maximize $Z = 4x + y$

Subject to the constraints: $x + y \leq 50$

$3x + y \leq 90$

$x, y \geq 0$

24. Find the present value of a perpetuity of Rs. 18,000 payable at the end of each quarter, if the money is worth 4% p.a. compounded quarterly.

25. Sonam bought a mobile phone for Rs. 25000. The mobile phone is estimated to have a scrap value of Rs. 3000 after a span of 4 years using linear depreciation method, find the book value of the mobile at the end of 2 years.

or

A person places Rs. 2,25,000 in a no fee fund to be invested for one year. At the end of the year the value of the fund was Rs. 2,81,250. Find the remind rate of return, given that the market price is same at the end of the year.

Section C

26. The speed of a boat in still water is 8km/hr. It can go 30km. upstream and 44km downstream in 10 hours. Find the speed of the stream.

27. Evaluate: $\int_2^8 |x-5|dx$

or

Find the area of the region bounded by parabola $y^2 = x$ and the line $y + x = 2$ and x – axis.

28. Solve the differential equation:

$(e^x + 1)y\,dy = (y + 1)\,e^x dx$

29. Find the probability that atmost 3 defective fuses will be found in a box of 200 fuses if experience shows that 2% of such fuses are defective. ($e^{-4} = 0.0183$)

30. A factory produces PVC pipes with mean inner diameter of 4cm. A sample of 17 pipes gives a mern inner diameter of 4.02 and standard deviation of 0.09 cm. Is the difference in the value of means significant? Test at 5% level of significance. [$t_{16}(0.05)=2.120$]

31. Rishabh exchanged his old car valued at Rs 1,50,000 with a new one priced at Rs. 6,50,000. He also paid Rs. x as down payment and the balance in 20 monthly instalment of Rs. 21000 each. The rate of interest offered to him is 9% p.a. Find the value of x?

or

A person has set up a sinking fund in order to have Rs. 1,00,000 after 10 years for his daughter's education. How much amount should be set aside at the end of each six months into an account paying 5% p.a. compounded half yearly.

Section D

32. Two pipes A and B can fill tank in 32 minutes and 48 minutes respectively. Both the pipes are opened together for same time and then pipe B is closed. If the tank is filled in 24 minutes, then find after how many minutes B is closed.

33. A radio manufacturer finds that he can sell x rdios per week at Rs. p each. Where p = $2(100 - \frac{x}{4})$. His cost of production of x radios per week is Rs. $(120x + \frac{x^2}{2})$. Show that his profit is maximum when the production is 40 radios per week. Also find his maximum profit per week.

or

Determine the intervals in which the following function are strictly increasing or strictly decreasing:

$f(x) = x^4 - 8x^3 + 22x^2 - 24x + 27$

34. A random variable X has the following probability distribution value of X:

X:	0	1	2	3	4	5	6	7
P(X):	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

find (i) k (ii) P(X<3) (iii) P(X >6) (iv) P(X < 6) (v) P (0 < X < 5)

or

An Urn contains 5 white, 7 red, 8 black balls. If four balls are drawn one by one with replacement, what is the probability that (i) all are white (ii) only 3 are white (iii) None is white.

35. A startup company invested Rs. 1,50,000 in shares for 4 years. The value of the investment was Rs.1,90,000 at the end of second year, Rs. 1,75,000 at the end of third year and on maturity, the final value stood at Rs. 2,25,000. Calculate the CAGR on the investment.

36. There are three families A, B and C. The number of members in these families are given in the table below:

	Men	Women	Children
Family A	3	2	1
Family B	2	4	2
Family C	4	3	2

The daily expenses of each man, woman and child are respectively Rs. 200, Rs. 100 and Rs. 50.

(i) What is the total daily expense of family A?

(ii) (a) What is the combined daily expense of all women?

or

(b) Find the combined expense of men in family A and children in family C.

37. A factory manufactures tennis rackets and cricket bats. A tennis racket takes 1½ h of machine time and 3 h of craftsmanship in its making, while a cricket bat takes 3 h of machine time and 1 h of craftsmanship. In a day, the factory has availability of not more than 42 h of machine time and 24 h of craftsmanship. Profit on a racket and on a bat are Rs. 20 and Rs. 10 respectively.

Based on the above information, answer the following questions:

(i) If x and y are the numbers of bats and rackets manufactured by the factory, then write the expression of total profit.

(ii) Write the constraint that relates the number of craftsmanship hours.

(iii) Determine the maximum profit (in Rs.) earned by the factory.

or

How many bats and rackets respectively, are manufactured to earn maximum profit?

38. Fit a straight line trend by using the method of least square for the following data:

Year	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Production (in tonnes	2	4	3	4	4	2	4	9	7	10	8

If the equation of the trend line can be written as $y_t = a + bx$ ....(i)

Based on the above information, answer the following questions.

i. Find the value of constants a and b in equation (i)

ii. Find trend value of year 1962.

or

Find the trend value of year 1970.

Pre Board Examination (2024-25)

Mathematics (Applied)

Marking Scheme / Hints to Solutions

Note:- Any other relevant answer not given here in but given by students are suitably awarded.

Q. No.	Value points / Key points	Marks allotted to each key point	Total points
	Section A		
1	d) 100 m	1	1
2	d) $\frac{x}{2} < \frac{y}{2}$	1	1
3	d) 2B	1	1
4	(a) $d \neq -\frac{8}{5}$	1	1
5	(a) $-\frac{1}{49t^3}$	1	1
6	(b) $(-\infty, -\frac{9}{2}]$	1	1
7.	(c) $\left(\frac{9}{10}\right)^5$	1	1
8	(a) 3	1	1
9	(a) 0 ~~Not defined~~	1	1
10	(c) 22, 29, 35, 41	1	1
11	(c) $\frac{R}{\lambda}$	1	1

12	(c) a function to be optimised	1	1
13	(a) 2	1	1
14	(c) 4 k.m/h	1	1
15	(b) $(-2, 3]$	1	1
16	(a) -54	1	1
17	(d) 9	1	1
18	(b) $\frac{1}{x}$	1	1
19	(b) Both A and R are true & R is not the correct explanation of A.	1	1
20	(b) Both A and R are true & R is not the correct explanation of A	1	1
21	Section B If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ then $f(A) = A^2 - 5A + 7I$ $f(A) = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$ $= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$ $= \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$	1 1	2

21

or

$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$$

$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1+6+2x \\ 2+10+x \\ 15+6+2x \end{bmatrix} = 0 \quad : 1/2$$

$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 7+2x \\ 12+x \\ 21+2x \end{bmatrix} = 0 \quad 1/2 \quad 2$$

$7+2x+12x+x^2+21+2x=0$ 1/2

$x^2+16x+28=0$

$(x+2)(x+14)=0$

$x=-2$ or $x=-14$ 1/2

22

$3x-4y=1$

$-2x+5y=-3$

$D=\begin{vmatrix} 3 & -4 \\ -2 & 5 \end{vmatrix} = 3\times5-8=7$ 1/2

$D_1=\begin{vmatrix} 1 & -4 \\ -3 & 5 \end{vmatrix} = 5-12=-7$ 1/2 2

$D_2=\begin{vmatrix} 3 & 1 \\ -2 & -3 \end{vmatrix} = -9+2=-7$ 1/2

$x=\frac{D_1}{D}$ $\quad y=\frac{D_2}{D}$

$x=\frac{-7}{7}=-1$ $\quad y=\frac{-7}{7}=-1$ 1/2

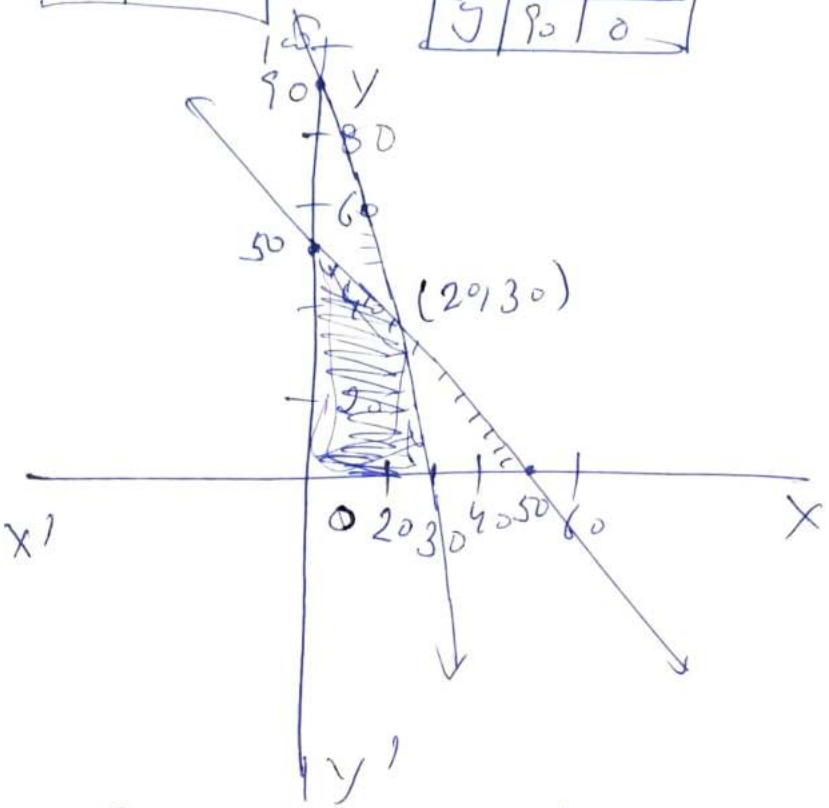
$x=-1,\ y=-1$

23 $x + y \leq 50$ $3x + y \leq 90, x, y \geq 0$

$x + y = 50$ $3x + y = 90$

x	0	50
y	50	0

x	0	30
y	90	0



1

2

Corner points of feasible region

$(0,0), (30,0), (0,50), (20,30)$

$Z = 4x + y$

$Z_{(0,0)} = 0$ $Z_{(30,0)} = 120 \rightarrow$ Max. Value.

$Z_{(0,50)} = 50$ $Z_{(20,30)} = 80 + 30 = 110$ 1

Z is maximum at $(30, 0)$

24 $R = ₹18000$

$r = 4\%$ p.a

$i = \frac{4}{4 \times 100} = \frac{1}{100}$ 1 2

$P = \frac{R}{i} = \frac{18000}{1} \times 100 = ₹1800000$ 1

25 Cost of Phone = ₹ 25000
Scrap value = ₹ 3000
Useful life = 4 years
Depreciation = $\frac{C-S}{n}$

$= \frac{25000-3000}{4}$ 1

$= ₹ 5500$

Book value at the end of 1 year 2

$= 25000 - 5500$

$= ₹ 19500$

Book value of Phone at the end of 2 years $= 19500 - 5500$

$= ₹ 14000$ 1

OR

25 V_i = ₹ 225000 (Original value) 1/2

V_f = ₹ 2,81,250 (Final value)

Nominal rate of return $= \frac{V_f - V_i}{V_i} \times 100$ 1/2 2

$= \frac{281250 - 225000}{225000} \times 100$

$= \frac{56250}{2250}$

$= 25\%$ 1

Section C

26 Speed of boat in still water = 8 k.m/h

$\therefore a = 8$

Let Speed of Stream = v k.m/h

A.T.Q

$$\frac{30}{a-v} + \frac{44}{a+v} = 10$$ 1

$$\frac{30}{8-v} + \frac{44}{8+v} = 10$$

$$30(8+v) + 44(8-v) = 10(64-v^2)$$

$$592 - 14v = 640 - 10v^2$$ 3

$$10v^2 - 14v - 48 = 0$$ 1

$$5v^2 - 7v - 24 = 0$$

$$(5v+8)(v-3) = 0$$

$v = -8/5$ or $v = 3$

rejected

$\therefore$ Speed of Stream = 3 k.m/h 1

27

$$\int_2^8 |x-5|\,dx$$

$$|x-5| = \begin{cases} x-5 & x \geq 5 \\ 5-x & x < 5 \end{cases}$$

$$-\int_2^5 (x-5)\,dx + \int_5^8 (x-5)\,dx$$ 1

$$\left[5x - \frac{x^2}{2}\right]_2^5 + \left[\frac{x^2}{2} - 5x\right]_5^8$$ 1

$$\left(5(5) - \frac{25}{2}\right) - (10 - 4) + \left[\frac{64}{2} - 40\right] - \left[\frac{25}{2} - 25\right]$$ 3

$$\left(25 - \frac{25}{2}\right) - (10 - 4) + (32 - 40) - \left(\frac{25}{2} - 25\right)$$

$$\frac{25}{2} - 8 - 8 + \frac{25}{2} = 25 - 16 = 9 \text{ sq unit}$$ 1

(27)

or

$y^2 = x \qquad y = -x + 2$

$(2 - x)^2 = x \qquad (1, 1), (4, -2)$

$4 + x^2 - 4x = x$

$x^2 - 5x + 4 = 0$

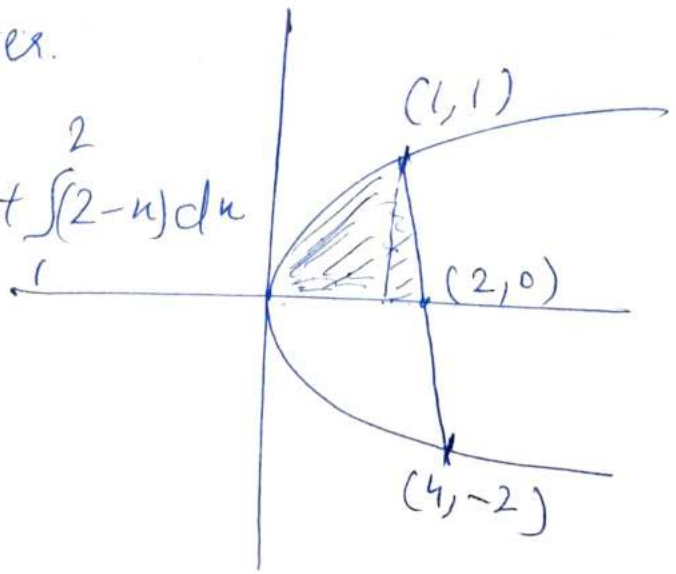
$x^2 - 4x - x + 4 = 0$

$x(x - 4) - 1(x - 4) = 0$ 1/2

$x = 1, 4$

Req. Area.

$$\int_0^1 \sqrt{x}\,dx + \int_1^2 (2 - x)\,dx$$ 1+1



$\frac{2}{3}x^{3/2}\Big|_0^1 + \left[2x - \frac{x^2}{2}\right]_1^2$

$\frac{2}{3} + (4-2) - \left(2 - \frac{1}{2}\right)$ 3

$\frac{2}{3} + 2 - \frac{3}{2} = \frac{7}{6}$ Sq. unit ½

28

$(e^x+1)y\,dy = (y+1)e^x\,dx$

$\int \frac{y}{y+1}\,dy = \int \frac{e^x}{e^x+1}\,dx$ ½

$\int \frac{y+1-1}{y+1}\,dy = \log|e^x+1| + c$ 1

$\int 1 - \frac{1}{y+1}\,dy = \log|e^x+1| + c$ ½ 3

$y - \log|y+1| = \log|e^x+1| + c$ ½

$y = \log|e^x+1| + \log|y+1| + c$

$y = \log(e^x+1)(y+1) + c$ ½

29

$n = 200$

$p = \frac{2}{100}$

$m = np = 4$

$P(X \le 3) = P(X=0) + P(X=1) + P(X=2) + P(X=3)$ 1

$= e^{-4}\frac{4^0}{\lfloor 0} + e^{-4}\frac{4^1}{\lfloor 1} + e^{-4}\frac{4^2}{\lfloor 2} + e^{-4}\frac{4^3}{\lfloor 3}$ 1

$= e^{-4}\left(1 + 4 + 8 + \frac{32}{3}\right)$

$= e^{-4}\left(13 + \frac{32}{3}\right) = e^{-4}\left(\frac{71}{3}\right)$ 3

$= \frac{71}{3} \times 0.0183 = \frac{4331}{10000} = 0.4331$ 1

30 Here $\mu = 4$ c.m (Population mean)

$\bar{x} = 4.02$ cm (Sample mean)

$s = 0.09$ c.m $\quad n = 17$

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n-1}}} = \frac{4.02 - 4}{\frac{0.09}{\sqrt{17-1}}}$$ 1

$$= \frac{0.02 \times 4}{0.09} = 0.889$$ 3

$v = n - 1 = 17 - 1 = 16$ degrees of freedom 1

$t_{16}(0.05) = 2.120$

$0.889 < 2.120$

∴ Hence there is no significant difference between the sample mean and Population mean at 5% level of significance. 1

31 Here $i = \frac{9}{1200} = 0.0075$, $n = 20$

$E = ₹ 21000$

Since Rishabh pays ₹ x as the down payment and got ₹ 150000 for his old car.

$\therefore P = ₹ (650000 - 150000 - x)$

$= ₹ (500000 - x)$

$E = \frac{Pi}{1-(1+i)^{-n}}$ 1½

$21000 = \frac{(500000 - x)0.0075}{1-(1+0.0075)^{-20}}$

$21000 = \frac{3750 - 0.0075x}{1-(1.0075)^{-20}}$ 3

$21000 = \frac{3750 - 0.0075x}{1-0.86118985}$ 1

$21000 \times 0.13881015 = 3750 - 0.0075x$

$2915.01 = 3750 - 0.0075x$

$x = \frac{834.99}{0.0075} = ₹ 111332.$ ½

31 (OR) Here $S = ₹ 100000$

$n = 10 \times 2 = 20$

$i = \frac{5}{100 \times 2} = 0.025$

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$ 1½

$$100000 = R\left[\frac{(1+0.025)^{20} - 1}{0.025}\right]$$ ½

$$100000 = R\left[\frac{(1.025)^{20} - 1}{0.025}\right]$$ ½

$$100000 = R\left[\frac{1.6386 - 1}{0.025}\right]$$ 3

$$R = \frac{100000 \times 0.025}{0.6386}$$

$$= ₹3914.81$$ ½

Section D

32 Part of tank filled by pipe A in 1 minute $= \frac{1}{32}$

Part of tank filled by pipe B in 1 minute $= \frac{1}{48}$ 1

Part of tank filled by pipe A and B in 1 minute $= \frac{1}{32} + \frac{1}{48}$

If A & B are opened for x minutes 1

A.T.Q

A 7 cs

$x\left(\frac{1}{32}+\frac{1}{48}\right)+(4-x)\times\frac{1}{32}=1$ — 1½

$x\left(\frac{3+2}{96}\right)+\frac{72-3x}{96}=1$ — 1½

$5x+72-3x=96$

$2x=24$

$x=12$

∴ Pipe B is closed after 12 minutes. — 1

5

33

$C(x)=120x+\frac{x^2}{2}$

$p=2\left(100-\frac{x}{4}\right)$

$R(x)=p\cdot x=2\left(100-\frac{x}{4}\right)\cdot x$

$=200x-\frac{x^2}{2}$ — 1½

$P(x)=\left(200x-\frac{x^2}{2}\right)-\left(120x+\frac{x^2}{2}\right)$ — 1½

$=80x-x^2$

$\frac{dP}{dx}=80-2x$ — 1½

for c.v. $\frac{dP}{dx}=0\Rightarrow 80-2x=0$

$80=2x$

$x=40$ — 1½

$\frac{d^2P}{dx^2}=-2<0\ \forall\ x$

∴ $x=40$ is the point of local Maxima — 1

	$\therefore$ Maximum Profit $= 80\times40-(40)^2$ $= 3200-1600$ $= ₹1600$	1	5
34	$P(X=0)+P(X=1)+P(X=2)+P(X=3)$ $+P(X=4)+P(X=5)+P(X=6)+P(X=7)=1$		
(i)	$0+k+2k+2k+3k+k^2+2k^2+7k^2+k=1$ $9k+10k^2=1$ $10k^2+9k-1=0$ $(10k-1)(k+1)=0$ $k=-1$ or $k=\frac{1}{10}$ $\downarrow$ rejected $k=\frac{1}{10}$	1	
(ii)	$P(X<3)=P(X=0)+P(X=1)+P(X=2)$ $=0+k+2k=3k=3\times\frac{1}{10}$ $=\frac{3}{10}$	1	
(iii)	$P(X>6)=P(X=7)=7k^2+k$ $=7\times\frac{1}{100}+\frac{1}{10}$ $=\frac{7+10}{100}$ $=\frac{17}{100}$	1	

(iv) $P(X<6)$

$P(X=0)+P(X=1)+P(X=2)+(X=3)$

$+P(X=4)+P(X=5)$

$0+k+2k+2k+3k+1k^2$

k^2+8k — 1

$\frac{1}{10}+\frac{8}{10}$

$\frac{1+8}{100}=\frac{81}{100}$ — 5

(v) $P(2X<5)$

$P(X=1)+P(X=2)+P(X=3)+P(X=4)$

$1k+2k+2k+3k$

$8k=8\times\frac{1}{10}=\frac{4}{5}$ — 1

35

$V_i = ₹150000$

$V_f = ₹225000$

$CAGR=\left(\frac{V_f}{V_i}\right)^{1/n}-1$ — 1

$=\left(\frac{225000}{150000}\right)^{1/4}-1$

$=(1.5)^{1/4}-1$ — 1

$(1.5)^{1/4} = x$

$\log x = \frac{1}{4} \log 1.5$

$\log x = \frac{1}{4}(0.1761)$

$\log x = 0.044025$

$x = \text{Anti log}(0.044025)$ — 1½

$= 1.108$

$CAGR = 1.108 - 1 = 0.108$

i.e $0.108 \times 100 = 10.8\%$ — 1½

5

Section E

36

$$\begin{matrix} A \\ B \\ C \end{matrix}\begin{bmatrix} 3 & 2 & 1 \\ 2 & 4 & 2 \\ 4 & 3 & 2 \end{bmatrix}\begin{bmatrix} 2\omega \\ 1\omega \\ 5\omega \end{bmatrix}$$

$$\begin{matrix} A \\ B \\ C \end{matrix}\begin{bmatrix} 6\omega + 2\omega + 5\omega \\ 4\omega + 4\omega + 1\omega \\ 8\omega + 3\omega + 1\omega \end{bmatrix}$$

$$\begin{matrix} A \\ B \\ C \end{matrix}\begin{bmatrix} 850 \\ 9\omega \\ 12\omega \end{bmatrix}$$

2

∴ Total daily expense of family A = ₹ 850

Women $\begin{bmatrix} 2 & 4 & 3 \end{bmatrix}_{1\times 3} \begin{bmatrix} 1\omega \\ 1\omega \\ 1\omega \end{bmatrix}_{3\times 1}$

$2\omega + 4\omega + 3\omega = 900$ 2

Combined daily expense of all women = ₹ 900

or

$\begin{bmatrix} 3 & 2 \end{bmatrix} \begin{bmatrix} 2\omega \\ 5\omega \end{bmatrix}$

$6\omega + 1\omega = 700$

∴ Combined expense of men in family A and Children in family C = ₹ 700 2

4

37 Let the number of bats and rackets manufactured by the factory be x and y respectively

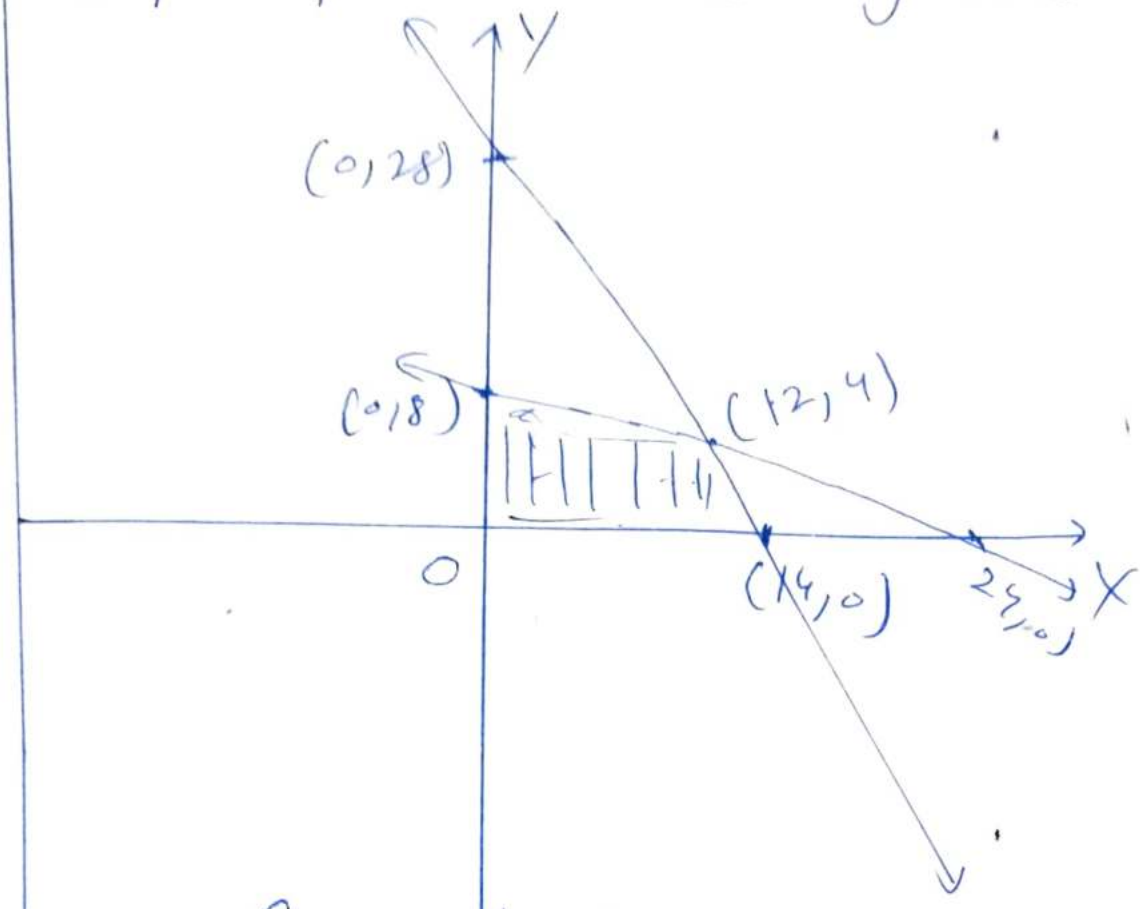
(i) ∴ Maximize profit $Z = 10x + 20y$ 1

(ii) Subject to Constraints

$3x + 1.5y \leq 42$, $x + 3y \leq 24$ 1

$x \geq 0$, $y \geq 0$

(iii) Graph of linear inequality are



4

Corner points (0,0), (14,0), (12,4), (0,8) 2

$Z_{(0,0)} = 0$ $Z_{(14,0)} = 140$

$Z_{(12,4)} = 200$ $Z_{(0,8)} = 160$

Maximum profit 200 at (12,4)

or

The number of bats and rackets are manufactured to earn maximum profit is ₹ 12 and ₹ 4 respectively.

38

Year	y	$x_i = t_i - 1967$	x^2	xy	$y_i = a + bx$
1962	2	−5	25	−10	1.73
1963	4	−4	16	−16	2.42
1964	3	−3	09	−9	3.11
1965	4	−2	04	−8	3.8
1966	4	−1	01	−4	4.99
1967	2	0	0	0	5.18
1968	4	1	01	4	5.87
1969	9	2	04	18	6.56
1970	7	3	09	21	7.25
1971	10	4	16	40	7.94
1972	08	5	25	40	8.63
	57	0	110	76	

$$a = \frac{\Sigma y}{n} = \frac{57}{11} = 5.18 \qquad b = \frac{\Sigma xy}{\Sigma x^2} = \frac{76}{110} = 0.69$$

$$y_i = 5.18 + 0.69x$$

4

(i) $a = 5.18$, $b = 0.69$ — 2

(ii) 1.73 — 1

(iii) 7.25 — 1