ANSWER KEY

SECTION A

Answer all the questions each question carries 1 mark

1. (c) 7
2. a)8.24%
3. (c) 3:5
4. (d)512
5. (b)11
6. (b) 2, 2
7. (d) 1
8. (a) 3
9. (c)continuous but not differentiable at $x = 0$
10. (a) 40000
11. (c) 2
12. (b) 84000
13. $K^2|A|$
14. (c) a skew symmetric matrix
15. a) Feasible region
16. b)31
17. a)1
18. (b) $y = e^{Cx}$
19. a) (i)
20. (c) A is true but R is false.

SECTION B

Answer all the questions each question carries 2 marks

21. 16.50(x+y)=15x+20y

16.50x+16.50y=15x+20y

1.50x=3.50y

Hence, required Ratio is 7:3

OR

Time taken to run 200 m = 3/5 × 200 = 120 seconds

Anuj ‘s time = 120 – 3 = 117 seconds

22. $2500=x^2+400+40x$, x= 30

PS= $30*25-\int_0^{30} s(x)dx$

PS= 360

OR

$I=xe^x-e^x+C$

23. Mean = 60kg

SD= 9/6 = 1.5 KG

24. Given, $V_f = 437500$, $V_i = 350000$
Nominal rate = $(V_f - V_i) / V_i \times 100$

$= (437500 - 350000) / 350000 \times 100$

$= 25\%$

25.

Year	**Y**	**3yr moving total**	**3yr moving average**
2016	25		
2017	30	87	29
2018	32	102	34
2019	40	117	39
2020	45	135	45
2021	50		
2022			

SECTION C

Answer all the questions each question carries 3 marks

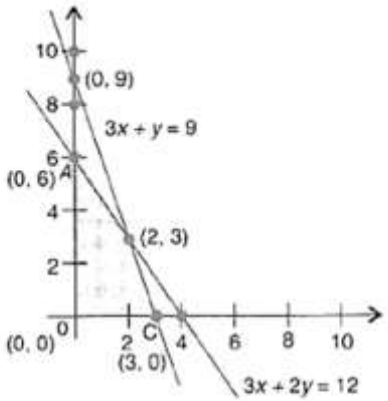
26.

Maximise Z = 7x+4y

Subject to

$3x+2y \leq 12$

$3x + y \leq 9$



Corner Points	$Z = 7x + 4y$
$O(0, 0)$	$z = 0$
$A(0, 6)$	$z = 24$
$B(2, 3)$	$z = 26$ (Maximum)
$C(3, 0)$	$z = 21$

27.

2011	124			
2012	120			
2013	135	519	129.75	
2014	140	540	135	132.375
2015	145	578	144.5	139.75
2016	158	605	151.25	147.875
2017	162	635	158.75	155
2018	170	665	166.25	162.5
2019	175			

28.

$$40\left(1-\frac{4}{40}\right)^3$$

= 29.16 litre

29.

$$\int x\log(1-x^2)dx = \frac{-1}{2}\int \log t\,dt$$

$$= \frac{-1}{2}(1-x^2)(\log(1-x^2)-1)+c$$

OR

$$\int \frac{dx}{x(x^2+1)} = -\frac{1}{2}\log\left(\frac{x^2+1)}{x^2}\right)+c$$

30.

CAGR=[(*FV/IV*)$^{1/n}$ − 1] × 100, where,

IV = Initial value of investment.

FV = Final value of investment.

⇒ 8.88 = [(25000/15000) $^{1/n}$ – 1] × 100

⇒ 0.0888 = (5/3)$^{1/n}$ – 1

⇒ 1.089 = (1.667)$^{1/n}$

⇒ 1/n log(1.667) = log(1.089)

$\Rightarrow n(0.037) = 0.2219$

$\Rightarrow n = 5.99 \approx 6$ years.

So, the time period for which the amount was invested is 6 years.

OR

$y-y_1 = m(x-x_1)$

$y+11 = 4(x+6)$

Equation of required tangent is $4x-y+13 = 0$

31.

Purchase = ₹ 40,00,000
Down payment = x Balance = 40,00,000 – x
= 0.0075,
n = 25 x 12 = 300
E = ₹ 30,000

$$30000 = \frac{(40000 - x) * 0.0075}{1 - (1.0075)^{-300}}$$

X = 424800
Downpayment =424800

SECTION D

Answer all the questions each question carries 5 marks

32. (i) P (no defective bucket) = P(r = 0) = $\frac{3^0 e^{-3}}{0!} = 0.049$

(ii) P (at most one defective bucket) = P(r = 0, 1)

$= \frac{3^0 e^{-3}}{0!} + \frac{3^1 e^{-3}}{1!}$

0.049 + 0.147 = 0.196

OR

(i) more than the mean score?

(i) When X = 45, $Z = 0$
P (X > 45) = P (Z > 0) = 0.5
⇒ 50% students scored more than the mean score

(ii) between 30 and 50?

(ii) When X = 30, $Z = -3$ and when X = 50, $Z = 1$
P (30< X< 50) = P (-3< Z < 1) = P (-3< Z ≤ 1)
= P ($-3 < Z \leq 0$) + P (0 ≤Z <1)
= P ($0 \leq Z < 3$) + P (0 ≤Z <1)
= 0.4987 + 0.3413 = 0.84
⇒ 84% students scored between 30 and 50 marks

33

F'(x) = $4x^2+12x+8$

F'' (x)= 0 , x = -2,1

At x = -2 f''(-2) = -4<0

X=-2 is a point of local maxima and local maximum Value = 13/3

X=-1 is a point of local minima and local minimum Value = 11/3

Or

P(x) = R(x) – C(x) = 5x – (100 + $0.025x^2$)

⇒P'(x) = 5 – 0.05 x

⇒ x = 100

As P''(x) = −0.05 < 0, ∀ x

∴ Manufacturing 100 dolls will maximize the profit of the company

And, Profit = ₹ 1,50,000

34.

$$\therefore A^{-1} = \frac{1}{-15}\begin{bmatrix} -3 & -3 & 0 \\ -5 & 5 & 5 \\ -1 & 4 & -5 \end{bmatrix} = \begin{bmatrix} \frac{1}{5} & \frac{1}{5} & 0 \\ \frac{1}{3} & -\frac{1}{3} & -\frac{1}{3} \\ \frac{1}{15} & \frac{-4}{15} & \frac{1}{3} \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \frac{1}{5} & \frac{1}{5} & 0 \\ \frac{1}{3} & -\frac{1}{3} & -\frac{1}{3} \\ \frac{1}{15} & \frac{-4}{15} & \frac{1}{3} \end{bmatrix} \begin{bmatrix} 10 \\ 0 \\ -1 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ Z \end{bmatrix} = \begin{bmatrix} 2+0+0 \\ \frac{10}{3}+0+\frac{1}{3} \\ \frac{2}{3}+0-\frac{1}{3} \end{bmatrix} = \begin{bmatrix} 2 \\ \frac{11}{3} \\ \frac{1}{3} \end{bmatrix}$$

Hence the value of x,y and z are 2,3/11 and 1/3 respectively.

35.$\lambda e^{3k} = 10000$

$\lambda e^{5k} = 40000$

$e^k = 2$

$\lambda 2^3 = 10000$

$\lambda = 1250$

Hence 1250 bacteria at the beginning

CASE STUDY QUESTIONS

36. (i) 8 hours

(i)10 hours

(iii) 10 hours 30 minutes

OR

17 hour 40 minutes

37

(i) n=7, p =1/6

(ii) $\left(\frac{5}{6}\right)^7$

(iii) $\left(\frac{1}{6}\right)^5$

OR

$1-\left(\frac{1}{6}\right)^5$

38.

(i) The book value at the end of the 7th year is 27892.33

(ii) The book value at the end of the 8 th year is 25660.94

(iii) Depreciation charge for the 8th year is 2231.39

OR

The scrap value of the machine is 21719.42