Pre Board Marking Scheme

Class - XII

Applied Maths

1. (a) $b = a + nq$ 2. (d) $\frac{1}{x^2}$ 3. (b) 2.52 4 (a) 44

5 (d) 14.4 Km 6. (a) Type I error. 7 (c) Truck A, 20 litres

8. (a) 80,000 9. (c) $\int_a^b |f(x)|\,dx$ 10 (b) Irregular 11. (a) 70,000

12 (d) at every point of the a line segment joining the points (0.6, 1.6) and (3,0)

13. (b) 3 14. (c) 13% 15. (c) 20% 16. (b) sample 17. (c) $\frac{p+s+t}{3}$

18 (b) 0.34 19. (a) (i) 20. (c) (iii)

21. $P = 14400$, $i = \frac{8}{400} = 0.02$ — (½)

$P = \frac{R}{i}$ — (½)

$14400 = \frac{R}{0.02} \Rightarrow R = ₹\ 288$ — (1)

22. $(I+A)^3 - 7A = I^3 + A^3 + 3A^2 + 3A - 7A$ — (1)

$= I + A + 3A + 3A - 7A$ — (½)

$= I$ — (½)

OR $|A| = -19$ — (½)

$adj\,A = \begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix}$ — (½)

$A^{-1} = -\frac{1}{19}\begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix} = \frac{1}{19}A$ — (1)

23. Max $z = 300x + 90y$ — (½) | Let x and y be number of wrist watch and wall clock

S.t

$3000x + 750y \leq 60000$ — (½)

or $4x + y \leq 80$

$x + y \leq 50$ — (½)

$x, y \geq 0$ — (½)

24. Let $x \rightarrow$ speed of motorboat in still water
$y \rightarrow$ speed of current

$$\frac{d}{x+y} = \frac{1}{2}\,\frac{d}{x-y} \quad — \ 1/2$$

$$\left.\begin{aligned} \frac{x-y}{x+y} &= \frac{1}{2} \\ \frac{x/y-1}{x/y+1} &= \frac{1}{2} \end{aligned}\right\} \ — \ 1/2$$

$$\frac{x}{y} = 3 \Rightarrow x : y = 3 : 1 \quad — \ (1)$$

OR Let x be the distance.

$$\frac{x}{4s} = \frac{x-60}{s} \ — (1) \Rightarrow x = 4x - 240 \ — \ 1/2$$

$$\Rightarrow x = 80 \text{ m.} \ — \ 1/2$$

25. $V_f = 2,50,000$, $V_i = 2,00,000$ — 1/2

Nominal Rate $= \frac{V_f - V_i}{V_i}$ — 1/2

$= \frac{50,000}{2,00000} \times 100 = 25\%$ — (1)

26. $f'(x) = 12x^2 - 36x + 27$ — 1/2

$= 3(4x^2 - 12x + 9)$ — 1/2

$= 3(2x-3)^2 \geq 0$ — (1) + 1/2 (For showing ≥ 0)

$f'(x) \geq 0$ so it is increasing fn — 1/2

27. March $P = \begin{matrix} \\ A \\ B \end{matrix} \begin{matrix} \text{Maths} & \text{Applied Maths} \\ \end{matrix} \begin{bmatrix} 400 & 230 \\ 230 & 425 \end{bmatrix}$ — 1/2

April $Q = \begin{bmatrix} 550 & 300 \\ 270 & 450 \end{bmatrix}$ — 1/2

Total $= P + Q = \begin{bmatrix} 950 & 530 \\ 500 & 875 \end{bmatrix}$ — (1)

28. $\int \frac{dt}{t^2}$ — (1/2) Put $1+xe^x = t$, $(e^x + xe^x)dx = dt$ — (1)

$= -\frac{1}{t} + c$ — (1)

$= -\frac{1}{1+xe^x} + c$ — (1/2)

OR $\frac{A}{x-1} + \frac{B}{x+3} = \frac{1}{(x-1)(x+3)}$ — (1/2)

$A = \frac{1}{4}, \quad B = -\frac{1}{4}$ — (1)

$\int \frac{1}{(x-1)(x+3)}\,dx = \frac{1}{4}\int \frac{dx}{x-1} - \frac{1}{4}\int \frac{dx}{x+3}$ — (1/2)

$= \frac{1}{4}\log|x-1| - \frac{1}{4}\log|x+3| + c$ — (1)

or $\frac{1}{4}\log\left|\frac{x-1}{x+3}\right| + c$

29. $P_0 = 10$

$10 = x_0^2 + 4x_0 + 5$

$x_0^2 + 4x_0 - 5 = 0$ — (1)

$x_0 = 1, -5 \rightarrow$ rejected

$PS = P_0 x_0 - \int_0^{x_0} P\,dx$ — (1/2)

$= 10\times 1 - \int_0^1 (x^2 + 4x + 5)\,dx$ — (1/2)

$= 10 - \left[\frac{1}{3} + 2 + 5\right] = \frac{8}{3}$ — (1)

OR $P_0 = 19$

~~$19 = 25 + 4x_0 + 5$~~ $\quad 19 = 25 - x_0 - x_0^2$

$x_0^2 + x_0 - 6 = 0 \Rightarrow x_0 = -3, 2$ (rejected) — (1)

$CS = \int_0^{x_0} P\,dx - P_0 x_0$ — (1/2)

$= \int_0^2 (25 - x - x^2)\,dx - 19\times 2$ — (1/2)

$= 50 - \frac{4}{2} - \frac{8}{3} - 38 = \frac{22}{3}$ — (1)

30. $P = 2,00,000$

$I = \frac{10}{100} \times 2,00,000 \times 5 = 1,00,000$ — (1)

$n = 5 \times 12 = 60$ — (1/2)

$EMI = \frac{P+I}{n}$ — (1/2)

$= \frac{3,00,000}{60} = ₹\ 5000$ — (1)

31. $n = 10 \times 2 = 20$, $S = 10,21,760$ — (1)

$i = \frac{5}{200} = 0.025$

$S = R\left[\frac{(1+i)^n - 1}{i}\right]$ — (1/2)

$1021760 = R\left[\frac{(1+0.025)^{20} - 1}{0.025}\right]$ — (1/2)

$1021760 = R\left[\frac{1.6386 - 1}{0.025}\right]$ — (1/2)

$R = \frac{1021760 \times 0.025}{.6386} = ₹\ 40,000$ — (1/2)

32. $P = \frac{2}{3}$, $Q = \frac{1}{3}$ — (1/2)

$P(X \geq 0) \geq 0.99$ — (1/2)

$1 - P(X=0) \geq 0.99$ — (1/2)

$1 - {}^nC_0 \left(\frac{2}{3}\right)^0 \left(\frac{1}{3}\right)^n \geq 0.99$ — (1/2)

$\left(\frac{1}{3}\right)^n \leq 0.01$

$3^n \geq 100$ — (1/2)

$n \geq 5$ Ans minimum no = 5 — (1/2)

OR $P = 0.02$, $n = 100$, $\lambda = np = 2$ — (1/2)

$P(X \leq 2) = P(X=0) + P(1) + P(2)$ — (1/2)

$= \frac{2^0}{0!} e^{-2} + \frac{2}{1!} e^{-2} + \frac{2^2}{2!} e^{-2}$ — (1/2)

$= e^{-2}[1 + 2 + 2]$ — (1/2)

$= 5e^{-2}$

$= 5 \times 0.135 = 0.675$ — (1/2)

33. $4a = x \quad a = \frac{x}{4}$ (5)

$2\pi r = 40 - x, \quad r = \frac{40-x}{2\pi}$ — ½

$A = \left(\frac{x}{4}\right)^2 + \pi\left(\frac{40-x}{2\pi}\right)^2$

$= \frac{x^2}{16} + \frac{(40-x)^2}{4\pi}$ — 1

$A'(x) = \frac{x}{8} - \frac{40-x}{2\pi} = 0$ — 1

$x = \frac{160}{\pi+4}$ — ½

$A''(x) = \frac{1}{8} + \frac{1}{2\pi} > 0 \rightarrow$ pt of minima — 1

1st piece $= \frac{160}{\pi+4}$ cm 2nd piece $= \frac{40\pi}{\pi+4}$ cm — ½+½

OR

~~$P = 20x - \frac{x^2}{4}$~~ $C(x) = 120x + \frac{x^2}{2}$

$R = px = 2\left(100 - \frac{x}{4}\right)x$ — 1

$R(x) = px = 200x - \frac{x^2}{2}$

$P(x) = R - C = 80x - x^2$ — 1

$\frac{dP}{dx} = 80 - 2x = 0$ — 1

$x = 40$

$\frac{d^2P}{dx^2} = -2 < 0 \rightarrow$ pt of Maxima — 1

Max Profit $= 80 \times 40 - (40)^2 = ₹\ 1600$ — 1

34. $AB = 8I$ — 1

$B^{-1} = \frac{1}{8}A$ — ½

$X = B^{-1}C = \frac{1}{8}\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}\begin{bmatrix} 4 \\ 9 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ -2 \\ -1 \end{bmatrix}$ — 2

$x = 3, \ y = -2, \ z = -1$ — ½

$= 5 \times 0.135 = 0.675$ — ½

35. Min $Z = 6x + 3y$

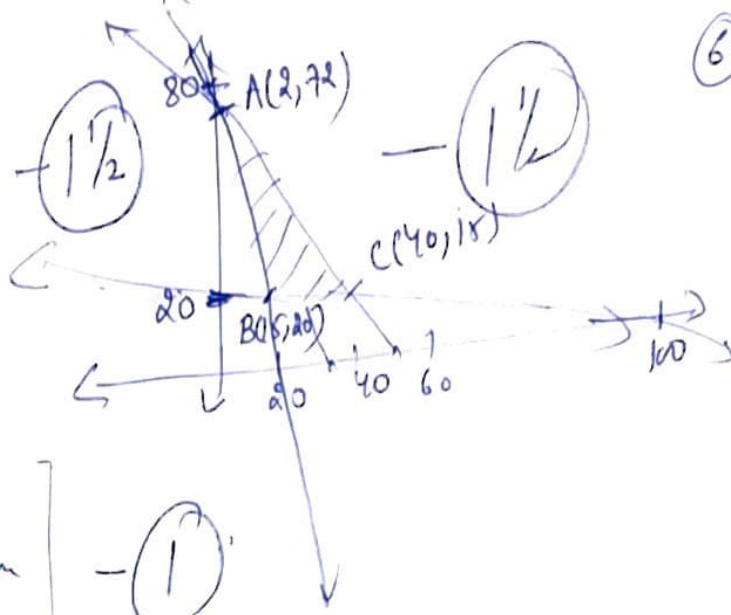
s.t

$12x + 3y \geq 240 \Rightarrow 4x + y \geq 80$

$4x + 20y \geq 460 \Rightarrow x + 5y \geq 115$

$6x + 4y \leq 300 \Rightarrow 3x + 2y \leq 150$

$x, y \geq 0$



(1½) (1½)

Corner Pt	Z	
A(2,72)	228	
B(15,20)	150	Minimum — (1)
C(40,15)	285	

Minimum amount of Vit A = 150 units. — (½)

Food I → 15 pKds Food II → 20 pKds — (½)

36. a) $\frac{2}{3} \times 60 = 40$ hrs — (1)

b) $\frac{1}{20} + \frac{1}{30} - \frac{1}{60} = \frac{1}{12}$ — (½)

12 hours — (½)

c) $\frac{t}{20} + \frac{t-3}{30} - \frac{t-4}{60} = 1$ — (½)

$\frac{3t + 2t - 6 - t + 4}{60} = 1$ — (½)

$t = \frac{58}{4} = 15\frac{1}{2}$ hr — (½)

Time 5 am + 15½ hr = 8:30 pm (½)

OR

Time to empty = 30 hr — (½)

A and B can fill in $\frac{1}{20} + \frac{1}{30} = \frac{5}{60} = \frac{1}{12}$ — (½)

12 hrs — (½)

Total time = 30 + 1 + 12 = 43 hours — (½)

37.

Year	Y	X	X^2	XY
2001	160	-2	4	-320
2002	185	-1	1	-185
2003	220	0	0	0
2004	300	1	1	300
2005	510	2	4	1020
	1375			815

— (1)

$$a = \frac{\Sigma Y}{n} = \frac{1375}{5} = 275$$

$$b = \frac{\Sigma XY}{\Sigma X^2} = \frac{815}{10} = 81.5$$

— (1½)

$$Y_c = a + bX$$
$$= 275 + 81.5Y$$

OR

Year	Y	3 yrs moving average
2001	160	—
02	185	188.3
03	220	235
04	300	343.3
05	510	

— (2)

b) $Y_{2010} = 275 + 81.5(2010 - 2003)$ — (½)

$= 275 + 570.5$

$= 845.5$ lakhs. — (1)

c) $275 + 81.5X = 1090$ — (1)

$X = 10$

estimated year = 2013 — (1)

38.

a) $\frac{K}{6} + \frac{2K}{6} + \frac{3(1-K)}{6} + \frac{4K}{2} = 1 \Rightarrow K = \frac{1}{4}$ — (1)

b) $P(X \geq 2) = \frac{1}{2} + \frac{3}{8} + \frac{1}{24} = \frac{23}{24}$ — (1)

c)

X	P(X)	X P(X)
1	1/24	1/24
2	8/12	1/6
3	3/8	9/8
4	1/2	2
		80/24

— 1½

$E(X) = \frac{80}{24} = 3\frac{1}{3}$ weeks — ½

OR

X	P(X)	X P(X)
9600	1/24	9600/24
12000	1/12	12000/12
20000	3/8	60000/8
50000	1/12	50000/12

1½

$E(X) = ₹\ 33,900$ — ½