(I) Q. P. code 50140 set J 50140 (1)

**Q1** $f(x) = x^2 - 4x + 3.$

$f(3) = 3^2 - 4\times3 + 3$ $\quad f(4) = 4^2 - 4\times4 + 3 = 16 - 16 + 3$

$f(-3) = -3^2 - 4(-3) + 3$

(b) $x + 2y = 4, \; x - 3y = -1.$

(c) $t_3 = 36, \; t_6 = 972, \; t_8.$

$t_n = ar^{n-1} \Rightarrow t_3 = ar^2 \Rightarrow 36 = ar^2$

$t_6 = ar^5 \Rightarrow 972 = ar^5$

$\frac{972}{36} = \frac{ar^5}{ar^2} \Rightarrow r^3 = \frac{972}{36}$

(d) ${}^9C_6 + {}^8C_5 + {}^7C_4 + {}^7C_3 \Rightarrow$ Using ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r.$

$\Rightarrow {}^9C_6 + {}^8C_5 + {}^8C_4 = {}^9C_6 + {}^9C_5 = {}^{10}C_6.$

(e) A.P : 3, 7, 11, $\quad a = 3, \; d = 4.$

$S_n = \frac{n}{2}[2a + (n-1)d].$

2(a) Regular sequence of payments.

(b) $A = \frac{c}{i}[(1+i)^n - 1] \Rightarrow 29,990 = \frac{9000}{i}[(1+i)^n - 1].$

(c)

(d)

(e) $r = \frac{8}{2}\% = 4\%.$

$A = P\left(1 + \frac{r}{2\times100}\right)^{2n}.$

$14038302.72 = 1,20,00\,000\left(1 + \frac{8}{2\times100}\right)^{2\times n}.$

3(A)(i) $S_n = 0.4 + 0.44 + 0.444 + \cdots$ ②

$= 0.4\left[\cdot1 + 0.11 + 0.111 + 0.1111 + \cdots\right]$

$= \frac{0.4}{9}\left[0.9 + 0.99 + 0.999 + \cdots\right]$

$= \frac{0.4}{9}\left[(1-0.1) + (1-0.11) + 1 - 0.111 + \cdots\right]$

$= \frac{0.4}{9}\left[(1+1+1\cdots) - (0.1 + 0.11 + 0.111 + \cdots)\right]$

$= \frac{0.4}{9}\left[n - \left\{0.1\left(\frac{1-0.1^n}{1-0.1}\right)\right\}\right]$ Ans

(ii) $a, ar, \frac{a}{r}$

$a + ar + \frac{a}{r} = 35$

$a \times ar \times \frac{a}{r} = 1000$

$a^3 = 1000, \quad a = 10$

$10 + 10r + \frac{10}{r} = 35$

$10r + \frac{10}{r} = 25$

$10r^2 + 10 = 25r$

$10r^2 - 25r + 10 = 0$

$\cancel{2r^2 - 5r + 2 = 0}$

$\cancel{2r^2 - 4r - r + 2 = 0}$

$\cancel{2r(r-2) - 1(r-2)}$

$10r^2 - 25r + 10 = 0$

$2r^2 - 5r + 2 = 0$

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

$2r(r-2) - 1(r-2) = 0$

$r = \frac{1}{2}, \; r = 2$

Q3



(B). $P = ₹ 40{,}000,\ n = 4,\ r = 10\%$.

RBM: $P = \frac{c}{i}\left[1 - (1+i)^{-n}\right]$

$40{,}000 = \frac{c}{0.1}\left[1 - (1+0.1)^{-4}\right]$

FIR $\Rightarrow$ $A = P(1+in)$

$A = 40{,}000(1 + 0.1 \times 4)$.

$EMI = \frac{A}{n}$

(C) $f(x) = 2x^3 - 9x^2 + 12x + 5$

$f'(x) = 6x^2 - 18x + 12 \Rightarrow f'(x) = 6(x^2 - 3x + 2)$.

$f''(x) = 12x - 18$.

$\cancel{f''(x) = 0,\ 12x - 18,\ x =}$

$f'(x) = 0, \quad 6(x^2 - 3x + 2) = 0, \quad x^2 - 3x + 2 =$

$x^2 - 2x - x + 2$

$x(x-2) - 1(x-2)$

$x = 1, x = 2$

put $x = 1$ and $x = 2$. in $f''(x)$.

$f''(x=1) = 12 - 18 = -6 < 0$ maxima

$f''(x=2) = 12 \times 2 - 18 = 6 > 0$ minima.

$f(x=1)$

$f(x=2)$.

Q. 4(A). $\begin{bmatrix} 5 & 3 & 14 \\ 0 & 1 & 2 \\ 1 & -1 & 2 \end{bmatrix}$, $|A| = 5(2+2) - 3(0-2) + 14(0-1)$

$= 20 + 6 - 14 = \underline{\underline{28}} \neq 0$

$A^{-1} = \begin{bmatrix} A_{11} & A_{21} & A_{31} \\ A_{12} & A_{22} & A_{32} \\ A_{13} & A_{23} & A_{33} \end{bmatrix} \Big/ |A|$.

Q4(a) $\frac{dy}{dx} = \frac{(2x+1)(6x+4)-(3x^2+4x-5)(2)}{(2x+1)}$ (04)

(ii) $\frac{dy}{dx} = \frac{(x-3)(x-2)(2x+4) - (x^2+4x+1)(2x-5)}{(x-3)(x-2)}$

(iii) $\frac{dy}{dx} = \frac{\sqrt{x}}{2x+4} = \frac{(2x+4)\frac{1}{2\sqrt{x}} - \sqrt{x}(2)}{(2x+4)^2}$

(iv) $\frac{dy}{dx} = \frac{(4x+1)(12x+28) - (2x+7)(3x-2)(4)}{(4x+1)^2}$

(c) $5x+3z-2y=9, \quad 3x+4y = 10-2z, \quad x+y+z=2$

$D = \begin{vmatrix} 5 & -2 & 3 \\ 3 & 4 & 2 \\ 1 & 1 & 1 \end{vmatrix} = 5(4-2)+2(3-2)+3(3-4) = 10+2-3 = 9 \neq 0$

$Dx = \begin{vmatrix} 9 & -2 & 3 \\ 10 & 4 & 2 \\ 2 & 1 & 1 \end{vmatrix}, \quad Dy = \begin{vmatrix} 5 & 9 & 3 \\ 3 & 10 & 2 \\ 1 & 2 & 1 \end{vmatrix}$

$Dz = \begin{vmatrix} 5 & -2 & 9 \\ 3 & 4 & 10 \\ 1 & 1 & 2 \end{vmatrix}$

$x = \frac{Dx}{D}, \quad y = \frac{Dy}{D}, \quad z = \frac{Dz}{D}$

(D) 05? $a=\sqrt{3}$, $r=\sqrt{3}$, $S_n = 120 + 40\sqrt{3}$.

$$S_n = \frac{a(r^n - 1)}{r-1} \Rightarrow 120 + 40\sqrt{3} = \frac{\sqrt{3}(\sqrt{3}^n - 1)}{\sqrt{3} - 1}.$$

$$40\cancel{\sqrt{3}}(1+\sqrt{3}) = \frac{\cancel{\sqrt{3}}(\sqrt{3}^n - 1)}{\sqrt{3} - 1}.$$

$$40(1+\sqrt{3})(\sqrt{3} - 1) = \sqrt{3}^n - 1$$

$$40(3-1) = \sqrt{3}^n - 1 \Rightarrow \sqrt{3}^n = 81.$$

(G) (i) $\frac{3x^2}{2} + \log x + 2e^x + C$

(ii) $\frac{2x^2}{2} + 2\log x - \int 3x^{-1/3} dx$

$$x^2 + 2\log x - \frac{3x^{-1/3+1}}{-1/3+1} + C$$

0

=0

=0

(iii) $$\int \frac{x^2 + 3x - 4x - 12}{\sqrt{x}} dx.$$

$$= \int \left(\frac{x^2}{\sqrt{x}} + \frac{3x}{\sqrt{x}} - \frac{4x}{\sqrt{x}} - \frac{12}{\sqrt{x}}\right) dx$$

$$= \int \left(x^{2-1/2} + 3\sqrt{x} - 4\sqrt{x} - 12x^{-1/2}\right) dx$$

$$= \frac{2}{7}x^{7/2} - \frac{2}{3}x^{3/2} - 2\times 12 x^{1/2} + C.$$