

Ans-no-01

Year	Income	3 Year semi total	3-Year semi average	Trend value
2008	43			$52.667 - 10.555 = 42.112$
2009	51	158	52.667	$42.112 + 10.555 = 52.667$
2010	64			$52.667 + 10.555 = 63.222$
2011	76			$63.222 + 10.555 = 73.777$
2012	81	253	84.333	$73.777 + 10.555 = 84.332$
2013	96			$84.332 + 10.555 = 94.887$

Here,
Difference between the central year
 $= (2012 - 2009) = 3$
Difference between the semi-averages
 $= (84.333 - 52.667) = 31.666$
Increase the trend value for one
year $= \frac{31.666}{3} = 10.555$
[Ans]

Ans-no-02

Year	Income	3 Year semi total	3 Year semi Average
2004	40	---	---
2005	42	121	40.333
2006	39	106	35.333
2007	25	91	30.333
2008	27	103	34.333
2009	51	106	35.333
2010	28	105	35
2011	26	85	28.333
2012	31	87	29
2013	30	109	36.333
2014	48	---	---

[Ans]

Ans-no-03

The transition probability matrix

$$P = \begin{bmatrix} P_{00} & P_{01} \\ P_{10} & P_{11} \end{bmatrix} = \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$$

We need P_{00}^5 in P^5

$$P^2 = \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix} \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$$

$$= \begin{bmatrix} 0.68 & 0.32 \\ 0.64 & 0.36 \end{bmatrix}$$

$$P^4 = \begin{bmatrix} 0.68 & 0.32 \\ 0.64 & 0.36 \end{bmatrix} \begin{bmatrix} 0.68 & 0.32 \\ 0.64 & 0.36 \end{bmatrix}$$

$$= \begin{bmatrix} 0.6672 & 0.3328 \\ 0.6656 & 0.3344 \end{bmatrix}$$

$$P^5 = \begin{bmatrix} 0.6672 & 0.3328 \\ 0.6656 & 0.3344 \end{bmatrix} \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$$

$$= \begin{bmatrix} 0.66656 & 0.33344 \\ 0.66688 & 0.33312 \end{bmatrix}$$

The required probability is 0.66656 [Ans]

Ans-no-04Given, Poisson rate $\lambda = 2$ per minute.

$$\text{(i)} P(\text{more than 1 minute}) = P(T > 1)$$

$$= e^{-\lambda t} = e^{-2 \times 1} = 0.13534.$$

$$\text{(ii)} P(\text{less than 2 minutes}) = P(T < 2)$$

$$= 1 - e^{-\lambda t} = 1 - e^{-2 \times 2} = 0.98168.$$

$$\text{(iii)} P(\text{between 1 to 2 minutes}) = P(1 < T < 2)$$

$$= e^{-\lambda t_1} - e^{-\lambda t_2} = e^{-2 \times 1} - e^{-2 \times 2}$$

$$= 0.11702 \quad [\text{Ans}]$$