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Ans. to the Q. No. 1

Years	Income	1-Years semi Total	2-Years semi Avg.	Total Values
2008	43			$52.67 - 10.55$ $= 42.11$
2009	51	158 $=$	52.67	$42.11 + 10.55$ $= 58.67$
2010	64			$52.67 + 10.55 = 63.22$
2011	76			$63.22 + 10.55$ $= 73.77$
2012	81	253	84.33	$73.77 + 10.55$ $= 34.32$
2013	96			$84.32 + 10.55$ $= 94.37$

Now,

Difference between the central years

$$2012 - 2009 = 3$$

Difference between the semi-Average

$$= 84.33 - 52.67$$

$$= 31.66$$

Income trend value for one years

$$= \frac{31.66}{3} = 10.55$$

Ans to the Q. No. 3

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} in P^5

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

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

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

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

$$P^5 = \begin{bmatrix} 0.6656 & 0.3334 \\ 0.6688 & 0.33312 \end{bmatrix}$$

The required probability in 0.66656

[Ans]

Ans. to the Q. No. 4

1) more than 1 minute

$$P(T>1) = e^{\lambda t} = e^{-2\times 1} = 0.1353$$

i) less than 2 minutes

$$P(T<2) = 1 - e^{-\lambda t}$$
$$= 1 - e^{-2\times 2}$$
$$= 0.9816$$

iii) Between 1 to 2 minutes

$$P(1<T<2) = e^{-\lambda t} - e^{\lambda t_2}$$
$$= e^{-2\times 1} - e^{-2\times 2}$$
$$= e^{-2} - e^{-4}$$
$$= 0.117$$