S.No. 4

Computational Statistics and Probability

Section [O]

Assignment 1
Finals

Khan, Mashiur Rahman
18-36303-1

① (i) 2008, 2009, 2010

3 years semi-total = 43 + 51 + 64
= 158

Semi-average = 158/2 = 79

(ii) 2011, 2012, 2013

76 + 81 + 96
= 253

semi average = 253/2
= 126.5

Trend values = 2008 − 79 − 15.8 = 63.2
2009 − 63.2 + 15.8 = 79
2010 − 79 + 15.8 = 94.8
2011 − 94.8 + 15.8 = 110.6
2012 − 110.6 + 15.8 = 126.4
2013 − 126.4 + 15.8 = 142.2

Difference between the central years =
2012 − 2009 = 3

Δ semi-averages = 47.5

Increase in trend for one year = 47.5/3
= 15.8

Years	2008	2009	2010	2011	2012	2013
Trend values	63.2	79	94.8	110.6	126.4	142.2

Ans

② (2)

Years	Loans	3y semi-total	3y semi average
2004	40	—	—
2005	42	121	40.33
2006	39	106	35.33
2007	25	91	30.33
2008	27	103	34.33
2009	51	106	35.33
2010	28	105	35
2011	26	85	28.33
2012	31	87	29
2013	30	109	36.33
2014	48	—	—

S. No. 4

③

$$P = \begin{bmatrix} 0.6 & 0.4 \\ 0.0 & 0.2 \end{bmatrix}$$

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

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

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

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

$$P^5 = \begin{bmatrix} 0.6672 & 0.3328 \\ 0.6656 & 0.3344 \end{bmatrix}\begin{bmatrix} 0.6 & 0.4 \\ 0.0 & 0.2 \end{bmatrix}$$

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

Probability of people entering the shop from 9-2pm = 0.66656 //

④ (i) $(T > 1\text{min}) \approx P(T>1) = e^{-\lambda t} = e^{-2\times 1} = 0.1353$

(ii) $(T < 2m) \approx$ ~~$P(T<2) =$~~

$$P(T<2) = -e^{-\lambda t} + 1$$
$$= 1 - e^{-4}$$
$$= 0.9816$$

(iii) $P(1 < T < 2)$

$$= e^{-\lambda t_1} - e^{-\lambda t_2}$$
$$= e^{-2} - e^{-4}$$
$$= 0.117$$

Zubair Chowdhury

19-41241-2

Serial ; 6

Ans no 1

Trend value

Year	2008	2009	2010	2011	2012	2013
income	43	51	64	76	81	96

Year	Income	3 year total	3 year avg	Trend values
2008	43			
				52.67 - 10.55 = 42.11
2009	51	158	52.67	42.11 + 10.55 = 52.67
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 = 84.32
2013	96			84.32 + 10.55 = 94.87

Difference between central years = 2012 - 2009

= 3

" " semi average = 84.33 - 52.67

= 31.66

increase in trend value = $\frac{31.66}{3}$ = 10.55

Ans 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

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

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

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

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

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

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

Required Probability is 0.66656

i) More than 1 minute

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

ii) less than 2 minute

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

$$= 1 - e^{-2\times 2}$$

$$= 1 - e^{-4}$$

$$= 0.9816$$

iii) Between 1 to 2 minute

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

$$= e^{-2\times 1} - e^{-2\times 2}$$

$$= e^{-2} - e^{-4}$$

$$= 0.1353 - 0.0183$$

$$= 0.117$$

Final Assignment = 01

Name: Joy Matiebber
ID: 20-41959-1
Serial: 07

Ans to the q No:-01

Calculate the trend value using semi-averages method.

Year	2008	2009	2010	2011	2012	2013
Income (in crores)	43	51	64	76	81	96

Ans:

Year	Income	3-Year semi total	3-Year semi Avg	Trend values
2008	43			52.67 - 10.55 = 42.11
2009	51	158	52.67	42.11 + 10.55 = 52.67
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 = 84.32
2013	96			84.32 + 10.55 = 94.87

NOW

Difference between the central years = 2012 - 2009
= 3

Difference between the semi-averages = 84.33 - 52.67
= 31.66

Increase in trend value for one year
$= \frac{31.66}{3}$
= 10.55

Jay Matubber
ID: 20-41959-1

Serial = 07
Section = [C]

Ans NO:-02

3-Year Moving Average.

Year	Loan Income	3-Year semi total	3-Year semi-average
2004	40	------	-------
2005	42	121	40.33
2006	39	106	35.33
2007	25	91	30.33
2008	27	103	34.33
2009	51	106	35.33
2010	28	105	35
2011	26	85	28.33
2012	31	87	29
2013	30	109	36.33
2014	48	------	-------

Ans NO:-03

The transition probability Matrix: P

$$P = \begin{bmatrix} P_{00} & P_{01} \\ P_{10} & P_{11} \end{bmatrix} = \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$$. We need P_{00}^5, P^5

Now,

$$P^2 = P \times P = \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix} \times \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix} = \begin{bmatrix} 0.68 & 0.32 \\ 0.64 & 0.36 \end{bmatrix}$$

Now,

$$P^4 = P^2 \times P^2 = \begin{bmatrix} 0.68 & 0.32 \\ 0.64 & 0.36 \end{bmatrix} \times \begin{bmatrix} 0.68 & 0.32 \\ 0.64 & 0.36 \end{bmatrix}$$

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

And,

$$P^5 = P^4 \times P = \begin{bmatrix} 0.6672 & 0.3328 \\ 0.6656 & 0.3344 \end{bmatrix} \times \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$$

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

So, The required probability is 0.66656.

Ans NO:-04

Let, T be the elapsed time between the entrance of $(n-1)^{th}$ and n^{th} signal.

And given poisson rate $\lambda = 2$ per minute

i) more than 1 minute,

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

(ii) less than 2 minute.

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

$$= 1 - e^{-2\times 2}$$

$$= 1 - e^{-4}$$

$$= 0.9816$$

iii) between 1 to 2 minute,

$$P(1<T<2) = e^{-\lambda t_1} - e^{-\lambda t_2}$$

$$= e^{-2\times 1} - e^{-2\times 2}$$

$$= e^{-2} - e^{-4}$$

$$= 0.1353 - 0.0183$$

$$= 0.117$$

Jawad Mohmmad
20-42006-1

Denial no: 08

Ans to qus no1

Year	Income	Five Yearly total	Five Yearly avg	Trend values
2008	43	158	52.67	52.67-10.55=92.11
2009	51			92.11+10.55=52.67
2010	64			52.67+10.55=63.22
291	76	253	84.33	63.22+10.55=73.77
2012	81			73.77+10.55=84.32
2013	76			84.32+10.55= 94.87

Now,

Difference between the central years = 2012 - 2007
= 5

Difference between the semi-avg = 84.33 - 52.67
= 31.66

Increase in trend value for one year = $\frac{31.66}{3}$
= 10.55

Ans to qu no 2

3 year ~~moving~~ Moving Average

Year	Loan	3 year sent total	3 year sent avg
2004	90	- - - -	- - - -
2005	92	121	90.33
2006	39	106	35.33
2007	25	71	30.33
2008	27	103	34.33
2009	51	106	35.33
2010	28	105	35
2011	26	85	28.33
2012	31	87	27
2013	70	107	36.33
2014	98	- - - -	- - - -

Ans to Qn 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 for 5 days

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

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

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

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

$$P^5 = \begin{bmatrix} 0.66672 & 0.33328 \\ 0.66656 & 0.33344 \end{bmatrix} \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$$

$$= \begin{bmatrix} 0.666656 & 0.333344 \\ 0.666688 & 0.333312 \end{bmatrix}$$

The probability is 0.666656

Ans.

Answer 4

(i) more than 4 minute

$$P(t>1) = e^{-1t} = e^{-2\times1} = 0.1353$$

(ii) less than 2 minute

$$P(T<2) = 1 - e^{-1t}$$
$$= 1 - e^{-2\times2}$$
$$= 1 - e^{-4}$$
$$= 0.9616$$

(iii) between 1 to 2 minute,

$$P(1<t<2) = e^{-\lambda t_1} - e^{\lambda t_2}$$
$$= e^{-2\times1} - e^{2\times2}$$
$$= 0.117 \text{ hr.}$$

ABU TAHER MAHIM SARKAR, ID: 20-42042-1, SL: 09

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~~ Loan	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-04

Given, Poisson rate $\lambda = 2$ per minute.

(i) P(more than 1 minute) = $P(T > 1)$

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

(ii) P(less than 2 minutes) = $P(T < 2)$.

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

(iii) P(between 1 to 2 minutes) = $P(1 < T < 2)$

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

$= 0.11702$ [Ans].

Final Assignment-1

Rifath Bin Mashrur, ID: 20-42071
serial: 10

1) Calculate the trend value using semi average method

Year	2008	2009	2010	2011	2012	2013
Income	43	51	64	76	81	96

Ans:

Year	Income	3 years semi	3 years semi Avg	Trend values
2008	43	158	52.67	52.67-10.55 = 42.11
2009	51			42.11+10.55 = 52.67
2010	64			52.67+10.55 = 63.22
2011	76	253	84.33	63.22+10.55 = 73.77
2012	81			73.77+10.55 = 84.32
2013	96			84.32+10.35 = 94.82

serial-10

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)

serial -10

2)

Year	loan	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	- - - -	- - - -

Serial - 10

Ans to the Que 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}^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 to the Que No. 4

Given Poisson rate $\lambda = 2$ per minute

(i) P(more than 1 minute) = $P(T > 1)$

$= e^{-2\lambda t}$

$= e^{-2 \times 1}$

$= 0.13534$

(ii) P(less than 2 minutes) = $P(T < 2)$

$= 1 - e^{-\lambda t}$

$= 1 - e^{-2 \times 2}$

$= 0.98168$

(iii) P(between 1 to 2 minutes) = $P(1 < T < 2)$

$= e^{-\lambda t_1} - e^{-\lambda t_2}$

$= e^{-2 \times 1} - e^{-2 \times 2}$

$= 0.11702$

(Ans)

Name : Md. Altabur Rahman

ID : 20-42107-1

Assignment - 1

Ans: 1

Year	Income	Semi total	semi Avg	Trend values
2008	93	158	52.67	52.67 + 10.55 = 62.11
2009	51			62.11 + 10.55 = 52.67
2010	69			52.67 + 10.55 = 63.22
2011	76	253	84.33	63.22 + 10.55 = 73.77
2012	81			73.77 + 10.55 = 84.32
2013	96			84.32 + 10.55 = 94.87

Year difference = 2012 - 2009

= 3

Semi Avg. difference = 84.32 - 52.67

= 31.65

Trend value = $\frac{31.65}{3}$

= 10.55

Ans. 2

Year	Loan	3-year semi total	3 year semi avg
2004	90	—	—
2005	92	121	40.33
2006	39	106	35.33
2007	25	91	30.33
2008	27	103	34.33
2009	51	106	35.33
2010	28	105	35
2011	26	85	28.33
2012	31	87	29
2013	30	109	36.33
2014	98	—	—

Ans. 3

The 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

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

$$= \begin{bmatrix} 1.2 & 0.8 \\ 1.6 & 0.4 \end{bmatrix}$$

$$P^4 = \begin{bmatrix} 1.2 & 0.8 \\ 1.6 & 0.4 \end{bmatrix} + \begin{bmatrix} 1.2 & 0.8 \\ 1.6 & 0.4 \end{bmatrix}$$

$$= \begin{bmatrix} 2.4 & 1.6 \\ 3.2 & 0.8 \end{bmatrix}$$

$$P^5 = \begin{bmatrix} 2.4 & 1.6 \\ 3.2 & 0.8 \end{bmatrix} + \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$$

$$= \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}$$

The required probability is 3.

Ans. 4

(i) more than one minute,

$$P(T>1) = e^{-\lambda t}$$
$$= e^{-2}$$
$$= 0.135$$

(ii) less than 2 minute

$$P(T<2) = 1 - e^{-\lambda t}$$
$$= 1 - e^{-4}$$
$$= 0.9816$$

(iii) between 1 to 2 minute,

$$P(1<T<2) = e^{-\lambda t_1} - e^{-\lambda t_2}$$
$$= e^{-2} - e^{-4}$$
$$= 0.1353 - 0.0133$$
$$= 0.117.$$

Final Assignment - 01

Name: Moon, Md. Mamunur Rahman
ID: 20-42439-1

Section: O
Serial: 12

Problem - 01

Trend values using Semi-average method:

Year	Income	3-year semi-total	3-year semi-average	Trend values
2008	43			52.66 - 10.56 = 42.1
2009	51	158	52.66	42.1 + 10.56 = 52.66
2010	64			52.66 + 10.56 = 63.22
2011	76			63.22 + 10.56 = 73.78
2012	81	253	84.33	73.78 + 10.56 = 84.34
2013	96			84.34 + 10.56 = 94.9

Difference between central years = 2012 - 2009
= 3 years

Difference between the semi-averages,
= 84.33 - 52.66
= 31.67

Increase in trend value for 1-year,
= 31.67 / 3
= 10.56

Problem - 02

Year	Loan	3-year semi Total	3-year semi average
2004	40	—	—
2005	42	121	40.33
2006	39	106	35.33
2007	25	91	30.33
2008	27	103	34.33
2009	51	106	35.33
2010	28	105	35
2011	26	85	28.33
2012	31	87	29
2013	30	109	36.33
2014	48	—	—

Problem - 03

Given, Probability of,

(9-10) and (10 - 11) is 0.6

(10 - 11) is 0.8

∴ The probability of entering customers up to 2PM to 9 AM (starting) is at Stage - 05.

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

$$\therefore P^5 = [P] \times [P] \times [P] \times [P] \times [P]$$

$$= \begin{bmatrix} 0.6665 & 0.3334 \\ 0.6668 & 0.3331 \end{bmatrix}$$

∴ The required probability is 0.6665 or 66.65 %

(Ans.)

Problem - 04:

Given,

Poisson rate of email entering, $\lambda = 2$ per minute

Probability of elapsed time between the entrance of 10th and 11th mail is,

(i) more than 1 minute,

$$P(T > 1) = e^{-\lambda t} = e^{-(2 \times 1)} = 0.13533$$

(ii) less than 2 minutes,

~~$P(T < 0.5)$~~

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

$$= 1 - 0.01831$$

$$= 0.98169$$

(iii) between 1 to 2 minutes,

$$P(1 < T < 2) = e^{-\lambda t_1} - e^{-\lambda t_2} = e^{-(\lambda \times 1)} - e^{-(2 \times 2)}$$

$$= (0.13533 - 0.01831)$$

$$= 0.11702 \quad \text{(Ans.)}$$

Zaid Amin Raotin
ID: 20-42459-1
Serial: 43

Ans. to the Q. No. 1

Years	Income	1-Years semi Total	2-Years semi Avg.	Total values
2008	43	158	52.67	52.67 − 10.55 = 42.11
2009	51			42.11 + 10.55 = 58.67
2010	64			52.67 + 10.55 = 63.22
2011	76	253	84.33	63.22 + 10.55 = 73.77
2012	81			73.77 + 10.55 = 84.32
2013	96			84.32 + 10.55 = 94.87

Now,

Difference between the centred years

$= 2012 - 2009 = 3$

Difference between the semi-Average

$= 84.33 - 52.67$

$= 31.66$

Income trend value for one years

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

20-42459-1

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^3

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

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

$$P^4_2 = \begin{bmatrix} 0.68 & 0.32 \\ 0.64 & 0.36 \end{bmatrix} \begin{bmatrix} 0.68 & 0.32 \\ 0.64 & 0.36 \end{bmatrix}$$

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

$$P^5_2 = \begin{bmatrix} 0.66656 & 0.33344 \\ 0.66688 & 0.33312 \end{bmatrix}$$

The required probability is 0.66656

[Ans]

Ans. to the Q. No. 4

(i) more than 1 minute

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

(ii) less than 2 minutes

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

(iii) Between 1 to 2 minutes

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

Name:- Md. Toonir Hossen
ID:- 20-42488-1

SL- 14

Ans to the Q. NO:- 1

Year	Income	3 year semi total	3 Year semi Avg	Trend Value
2008	43	158	52.67	52.67 - 10.55 = 42.11
2009	51			42.11 + 10.55 = 52.67
2010	64			52.67 + 10.55 = 63.22
2011	76	253	84.33	63.22 + 10.55 = 73.77
2012	81			73.77 + 10.55 = 84.32
2013	96			84.32 + 10.55 = 94.87

now.

Difference between the central Years - 2012 - 2009
= 3

Difference between the semi-avg = 84.33 - 52.67
= 31.66

∴ Increase in trend value for one year = $\frac{31.66}{3}$
= 10.55

Ans to the Q. No:- 2

3-Year Moving Average,

Year	Loan	3-Year Semi total	3-Year semi average
2004	40	.....	.....
2005	42	~~221~~ 121	40.33
2006	39	106	35.33
2007	25	91	30.73
2008	27	103	34.33
2009	51	106	35.33
2010	23	105	35
2011	26	85	28.33
2012	31	87	29
2013	30	109	36.33
2014	48	.....	.....

Ans to the Q.No:-03

The transition Probability matrix

$$P = \begin{bmatrix} P_{00} & P_{01} \\ P_{10} & P_{11} \end{bmatrix} = \begin{bmatrix} 0.6 & 0.4 \\ 08 & 0.2 \end{bmatrix}$$

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 to the Q.No:- 4

i) more than 1 minutes.

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

ii) Less than 2 minutes.

$$P(T<2) = 1 - e^{-\lambda T} = 1 - e^{-4}$$
$$= 0.98168$$

iii) between 1 to 2 minute,

$$P(1<T<2) = e^{-\lambda t_1} - e^{-\lambda t_2}$$
$$: e^{-2\times 1} - e^{-2\times 2}$$
$$: e^{-2} - e^{-4}$$
$$: 0.1333 - 0.0133$$
$$: 0.117$$

F.T. Assignment

Name: MD. Shanjidul Islam Sadlin
ID: 20-42621-1 serial: 15

(1)

Year	2008	2009	2010	2011	2012	2013
income (in crores)	43	51	64	76	81	96

Year	Icome	3 year semi total	3 year semi averge	Tends value
2008	43			52.67 - 10.553 = 42.057
2009	51	158	$\frac{158}{3} = 52.67$	42.057 + 10.553 = 52.67
2010	64			52.67 + 10.553 = 63.22
2011	76			63.22 + 10.553 = 73.78
2012	81	253	$\frac{253}{3} = 84.33$	73.78 + 10.553 = 84.33
2013	96			84.33 + 10.553 = 94.88

Difference between cntral year.

$2012 - 2009 = 3$

Difference between semi-avarage

$84.33 - 52.67 = 31.66$.

Increase in trand value for one year.

$31.66 / 3 = 10.553$

② From given data values.

Year	Loan	3 years semi total	3 years semi average
2004	40	---	---
2005	42	121	40.33
2006	39	106	35.33
2007	25	91	30.33
2008	27	103	34.33
2009	51	106	35.33
2010	28	105	35
2011	26	85	28.33
2012	31	87	29
2013	30	109	36.33
2014	48	---	---

(3) The transition matrix $P = \begin{bmatrix} P_{00} & P_{01} \\ P_{10} & P_{11} \end{bmatrix}$

$$= \begin{bmatrix} 0.6 & 0.4 \\ 0.8 & 0.2 \end{bmatrix}$$ So, we need P_{00}^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 probability that the customer will enter the shop from 9am to 2pm is 0.66656

(4) Given $\lambda = 2$ per minute.

Probability of elapsed time between 10^{th} & 11^{th} mail

(i) more than 1 minute

$$P(T > 1) = e^{-\lambda t} = e^{-2 \times 1} = 0.13534$$

(ii) Less than 2 minute

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

$$= 1 - 0.01832$$

$$= 0.9817$$

(iii) between 1 - 2 minutes.

$$P(1 < T < 2) = e^{-\lambda t_1} - e^{-\lambda t_2}$$

$$= e^{-2 \times 1} - e^{-2 \times 2}$$

$$= 0.13534 - 0.01832$$

$$= 0.11702$$

Name : Sidul Islam Sohag

Id : 20-42668-1 Serial : 16

Answer to the Q: NO: 1

Calculate the trend value semi-average method.

Year	2008	2009	2010	2011	2012	2013
Income (incomes)	43	51	64	76	81	96

Ans:

Year	Income	3 Year semi Total	3 Year semi average	Trand value
2008	43	158	52.6	52.6 - 10.56 = 42.04
2009	51			42.04 + 1056 = 52.6
2010	64			52.6 + 10.56 = 63.16
2011	76	253	84.3	63.16 + 10.56 = 73.72
2012	81			73.72 + 10.56 = 84.28
2013	96			84.28 + 10.56 = 94.84

Different between the central years = 2012 - 2009
= 3

Difference between the semi-averages

$= 84.33 - 52.67$

$= 31.66$

Increase in trend value for one year

$= \frac{31.66}{3}$

$= 10.56$

Answer to the Q: No: 2

3-Year Moving Average,

Year	Ioun	3 Year semitotal	3-year semi average
2004	40	-----	-----
2005	42	121	40.33
2006	39	106	35.33
2007	25	91	30.33
2008	27	103	34.333
2009	51	106	35.333
2010	28	105	25
2011	26	85	18.333
2012	31	87	29
2013	30	109	36.333
2014	48	-----	-----

Answer 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}^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

4] i) more then 1 minte,

$$P(T>1) = e^{-\lambda t} = e^{-2X1} = 0.1353$$

ii) less than 2 minute

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

$$= 1 - e^{-2X2}$$

$$= 1 - e^{-4}$$

$$= 0.9816$$

iii] between 1 to ~~to~~ 2 minute,

$$P(1<T<2) = e^{-\lambda t_1} - e^{-\lambda t_2}$$

$$= e^{-2X1} - e^{-2X2}$$

$$= e^{-2} - e^{-4}$$

$$= 0.1353 - 0.0183$$

$$= 0.117$$

Name: Jannatul Ferdose Tanisha
ID: 20-42660-1
Serial: 17

Final Assignment - 1

Ans to the Question NO - 1

Calculate the trend value using semi averages method.

Years	2008	2009	2010	2011	2012	2013
Income	43	51	64	76	81	96

Ans:

Year	Income	5 Years semi total	7 years semi Avg	Trend values
2008	43	158	52.67	52.67 - 10.55 = 42.118
2009	51			42.11 + 10.55 = 52.67
2010	64			52.67 + 10.55 = 63.22
2011	76	253	84.33	63.22 + 10.55 = 73.77
2012	81			73.77 + 10.55 = 84.32
2013	96			84.32 + 10.35 = 94.87

Now,

Difference between the central Years = 2012-2009

= 3

4		4		4 Semi-averages =	84.33 - 52.67

= 31.66

Increase in trend value for one Years

$= \frac{31.66}{3}$

= 10.55

Ans to the Q. No - 2

Year	Loan	3-year semi Total	3 years semi average
2004	40	---	---
2005	42	121	40.83
2006	39	106	35.33
2007	25	91	30.33
2008	27	103	34.33
2009	51	106	35.33
2010	28	105	35
2011	26	85	28.33
2012	31	87	29
2013	30	109	36.33
2014	48	----	...

Ans to the Q. 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 to the Q.NO.—4

i) more than 1 minute,

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

ii) less than 2 minite,

$$P(T<2) = 1 \cdot e^{-\lambda t}$$
$$= 1 \cdot e^{-2\times 2}$$
$$= 1 - e^{-4}$$
$$= 0.9816$$

iii) between 1 to 2 minute

$$P(1<T<2) = e^{-\lambda t_1} - e^{-\lambda t_2}$$
$$= e^{-2\times 1} - e^{-2\times 2}$$
$$= e^{-2} - e^{-4}$$
$$= 0.1353 - 0.0183$$
$$= 0.117$$