Mid term paper

Muhammad Ali

Registration No: 19PWCSE1801

Class Section: A

Date:(8, 1, 2021)

Complex variable

Department of Computer Systems Engineering

University of Engineering and Technology, Peshawar

Day: M T W T F S

Question No 1

a)

$5x_1 + 4x_2 = 3 \times 60 = 180$

$4x_1 + 2x_2 = 2 \times 60 = 120$

$5x_1 + 4x_2 = 180 \quad — A$

$4x_1 + 2x_2 = 120 \quad — B$

Xing 2 by (B) the (-) from (A)

$5x_1 + 4x_2 = 180$

$\pm 8x \pm 4x_2 = -240$

$-3x_1 = -60 \Rightarrow \boxed{x_1 = 20}$

Put in eq (A)

$5 \times 20 + 4x_2 = 180$

$4x_2 = 180 - 100$

$4x_2 = 80$

$\boxed{x_2 = 20}$

$\boxed{x_1 = x_2}$ → same solution

2)

Date: __/__/__

Sol:-

$$A = \begin{bmatrix} ON & ON & OFF \\ OFF & ON & OFF \\ OFF & ON & ON \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

let $A+B = \begin{bmatrix} ON & ON & ON \\ ON & ON & ON \\ ON & ON & ON \end{bmatrix}$

$$A+B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

$$B = (A+B) - A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} - \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1-1 & 1-1 & 1-0 \\ 1-0 & 1-1 & 1-0 \\ 1-0 & 1-1 & 1-1 \end{bmatrix}$$

$$B = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

Day M T W T F S

Question No 2

a)

$$S_1 = \begin{bmatrix} 18.95 & 14.75 & 8.98 \end{bmatrix}$$
$$S_2 = \begin{bmatrix} 17.8 & 13.30 & 10.70 \end{bmatrix}$$

Let combin S_1 and S_2 in 2×3 order as S_3

$$S_3 = \begin{bmatrix} 18.9 & 14.7 & 8.98 \\ 17.80 & 13.5 & 10.70 \end{bmatrix}$$

S_3 is information about price of term

Prince reduce by 20%

$$S_3 = \begin{bmatrix} 18.95 \times 80\% & 14.7 \times 80\% & 8.9 \times 80\% \\ 17.5 \times 80\% & 13.5 \times 80\% & 10.7 \times 80\% \end{bmatrix}$$

$$S_3 = \begin{bmatrix} 15.16 & 11.8 & 7.18 \\ 14.24 & 10.8 & 8.65 \end{bmatrix}$$

Date: __/__/__

b) Solution :-

$p(x) = ax^2 + bx + c$

$f(x) = x e^{x-1}$

$p(1) = a(1)^2 + b(1) + c$

$p(1) = a + b + c$

$f(1) = 1e^{1-1}$

$f(1) = 1$

it is given that $f(1) = p(1)$. so

$a + b + c = 1 \longrightarrow (A)$

$p'(x) = 2ax + b$

$p'(1) = 2a + b$

$f'(x) = e^{x-1} + x e^{x-1}$

$f'(1) = e^{1-1} + 1 e^{1-1}$

$f'(1) = 1 + 1$

$f'(1) = 2$

$p''(x) = 2a$

$p''(1) = 2$

$f''(x) = e^{x(x+1)}(2+x)$

$f''(x) = e^{1-1}(2+1)$

$f''(x) = (1)(3)$

$f''(x) = 3$

D - T - D

Day M T W T F S S

Date

it is given that

$f'(x) = p'(1)$

$2a+b = 3 \longrightarrow (B)$

And,

$p''(1) = f''(1)$

$2a = 3 \longrightarrow (C)$

$\boxed{a = 3/2}$

put value of "a" in eq (B)

$2\left(\frac{3}{2}\right) + b = 3$

$3 + b = 2$

$\boxed{b = -1}$

put a & b in eq (A)

$a+b+c = 1$

$\frac{3}{2} - 1 + c = 1$

$c = 2 - \frac{3}{2}$

$\boxed{c = 1/2}$

Quadratic polynomial which statisfy the eq

$\boxed{p(x) = \frac{3}{2}x^2 - x + \frac{1}{2}}$

Day M T W T F S

Date. __/__/__

4)

Question No 3

a) Solution:-

$$A = \begin{bmatrix} 2 & 1 & 0 & -4 \\ r & 0 & 0.25 & -1 \\ -2 & -1.1 & 0.25 & 6.2 \\ 4 & 2.2 & 0.3 & -2.4 \end{bmatrix} \quad B = \begin{bmatrix} -3 \\ 1.5 \\ 5.6 \\ 2.2 \end{bmatrix}$$

By Rows Operation

$R_2 - 0.5 R_1$

$R_3 + R_1$

$$\sim \begin{bmatrix} 2 & 1 & 0 & -4 \\ 0 & -0.5 & 0.25 & 1 \\ 0 & -0.1 & 0.25 & 2.2 \\ 4 & 2.2 & 0.3 & -2.4 \end{bmatrix}$$

$R_4 - 2 R_1$

$$\sim \begin{bmatrix} 2 & 1 & 0 & -4 \\ 0 & -0.5 & 0.25 & 1 \\ 0 & -0.1 & 0.25 & 2.2 \\ 0 & 0.2 & 0.3 & 5.6 \end{bmatrix}$$

$R_3 + (0.1) R_1$

$P = I_0$

Date: ___/___/___

$$\sim \begin{bmatrix} 2 & 1 & 0 & -4 \\ 0 & -0.5 & 0.25 & 1 \\ 0 & 0 & 0.25 & 1.8 \\ 0 & 0.2 & 0.3 & 5.6 \end{bmatrix}$$

$R_4 - 0.2 R_1$

$$\sim \begin{bmatrix} 2 & 1 & 0 & -4 \\ 0 & -0.5 & 0.25 & 1 \\ 0 & 0 & 0.25 & 1.8 \\ 0 & 0 & 0.3 & 6.4 \end{bmatrix}$$

$R_4 - 1.2 R_3$

$$\sim \begin{bmatrix} 2 & 1 & 0 & -4 \\ 0 & -0.5 & 0.25 & 1 \\ 0 & 0 & 0.25 & 1.8 \\ 0 & 0 & 0 & 4.24 \end{bmatrix}$$

Upper triangular Matrix

$$A = \begin{bmatrix} 2 & 1 & 0 & -4 \\ 0 & -0.5 & 0.25 & 1 \\ 0 & 0 & 0.2 & 1.8 \\ 0 & 0 & 0 & 4.24 \end{bmatrix}$$

And Lower Traingular matrix

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0.5 & 1 & 0 & 0 \\ -1 & 0.2 & 1 & 0 \\ 2 & -0.4 & 2 & 1 \end{bmatrix}$$

$P - T$

Using Lower triangular matrix

to: $AX = b$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0.5 & 1 & 0 & 0 \\ -1 & 0.2 & 1 & 0 \\ 2 & -0.4 & 2 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix} = \begin{bmatrix} -3 \\ -1.5 \\ 5.6 \\ 2.2 \end{bmatrix}$$

$$a = -3$$

$$0.5a + b = -1.5$$

$$0.5(-3) + b = -1.5$$

$$b = -1.5 + 1.5$$

$$b = 0$$

$$-a + 0.2b + c = 5.6$$

$$(-1)(-3) + 0.2(0) + z_3 = +5.6$$

$$c = 2.6$$

$$2a - 0.4b + 2c + d = 2.2$$

$$2(-3) + 0.4(0) + 2(2.6) + d = 2.2$$

$$d = 3$$

b)

Date: __/__/__

Question No. 3

Part b)

Solution :-

$$A = \begin{bmatrix} 1 & 0 \\ 0 & k \end{bmatrix}$$

R is a unit square :

(0,0) (0,1) (1,0)

$$V = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

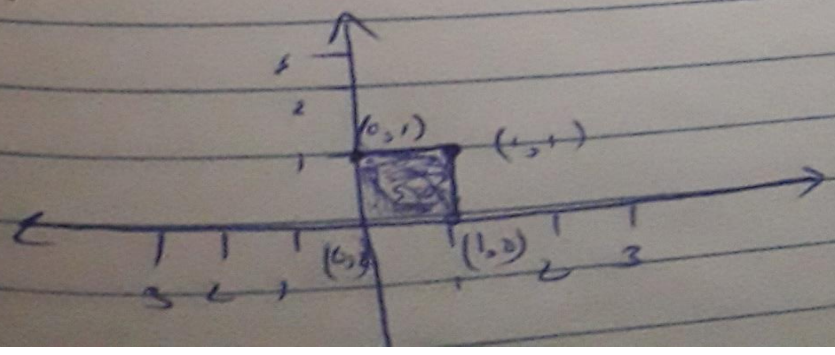
$$f(v) = AV$$

Now for $k = 1/2$

$$f(v) = \begin{bmatrix} 1 & 0 \\ 0 & 1/2 \end{bmatrix} \begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

$$f(v) = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 1/2 & 0 & 1/2 \end{bmatrix}$$

Plot :-



Date: __/__/__

Question No 4

a)

Solution :-

$$T = \begin{bmatrix} 0.8 & 0.3 & 0.2 \\ 0.1 & 0.5 & 0.2 \\ 0.1 & 0.2 & 0.6 \end{bmatrix}$$

$$x = \begin{bmatrix} 0.8 \\ 0.1 \\ 0.1 \end{bmatrix}$$

$$Tx = x'$$

$$x' = T \cdot x = \begin{bmatrix} 0.8 & 0.3 & 0.2 \\ 0.1 & 0.5 & 0.2 \\ 0.1 & 0.2 & 0.6 \end{bmatrix} \cdot \begin{bmatrix} 0.8 \\ 0.1 \\ 0.1 \end{bmatrix}$$

$$x' = \begin{bmatrix} 0.69 \\ 0.15 \\ 0.16 \end{bmatrix}$$

This is probability for which freshchild of a professional is also professional

Day M T W T F S

Date / /

8)

part b)

Solution :-

By Markov's chain

$$\pi_n = \pi$$

$$(T - I)\pi = 0$$

$$\pi = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

$$(T - I)\pi = \left(\begin{bmatrix} 0.8 & 0.3 & 0.2 \\ 0.1 & 0.5 & 0.2 \\ 0.1 & 0.2 & 0.6 \end{bmatrix} - \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \right) \pi$$

$$\Rightarrow \begin{bmatrix} -0.2 & 0.3 & 0.2 \\ 0.1 & -0.5 & 0.2 \\ 0.1 & 0.2 & -0.4 \end{bmatrix} \pi = 0$$

$$\Rightarrow \sim \left[\begin{array}{ccc|c} -0.2 & 0.3 & 0.2 & 0 \\ 0.1 & -0.5 & 0.2 & 0 \\ 0.1 & 0.2 & -0.4 & 0 \end{array}\right]$$

$$R_3 - R_2$$

$$\sim \left[\begin{array}{ccc|c} -0.2 & 0.3 & 0.2 & 0 \\ 0.1 & -0.5 & 0.2 & 0 \\ 0 & 0.7 & -0.6 & 0 \end{array}\right]$$

$$R_1 - R_2$$

$$\sim \begin{bmatrix} -0.2 & 0.8 & 0 \\ 0.1 & -0.5 & 0.2 \\ 0 & 0.7 & -0.6 \end{bmatrix}$$

9)

Date: __/__/__

$\Rightarrow -0.3a + 0.8b = 0$

$$\boxed{a = \frac{0.8}{0.3} b}$$

$\Rightarrow 0.7b - 0.6c = 0$

$$b = \frac{6}{7} c \Rightarrow \boxed{c = \frac{7}{6} b}$$

Probability vector :-

$$a + b + c = 1$$

$$\frac{8}{3} b + b + \frac{7}{6} b = 1$$

$$\frac{29}{6} b = 1$$

$$b = 6/29$$

$$\boxed{b = 0.208}$$

$$a = \frac{8}{3}\left(\frac{6}{29}\right) \Rightarrow \frac{16}{29}$$

$$\boxed{a = 0.56}$$

And,

$$c = \frac{7}{9}\left(\frac{6}{29}\right) = \frac{7}{29}$$

$$\boxed{c = 0.24}$$

$$X = \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 0.56 \\ 0.208 \\ 0.24 \end{bmatrix}$$