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Statistics - III

Set V

Q. 1. (a)

(i) (e) both (a) and (b)

(ii) (d) all of the above

(iii) (d) all of the above

(iv) (b) zero sum game

(v) (e) saddle point exists

(vi) (e) maximax

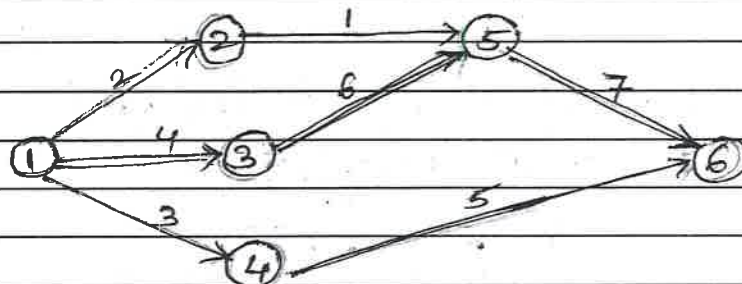
(vii) (e) maximum EMV

- 2 marks each

(b)

all subquestions - 2 marks each.

Q2 (i)



- 4 marks

Critical path is 1-3-5-6

- 1 mark

Duration is 17 weeks

- 1 mark

activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
$t_e$	2	4	3	1	6	5	7
$\sigma^2$	1	1	1	0	4	1	4

$$t_e = \frac{t_o + 4t_m + t_p}{6}$$

$$\sigma^2 = \left( \frac{t_p - t_o}{6} \right)^2$$

expected duration

- 2 marks

variance

- 2 marks

(ii)

(a) Network analysis

- 2 marks

Objectives

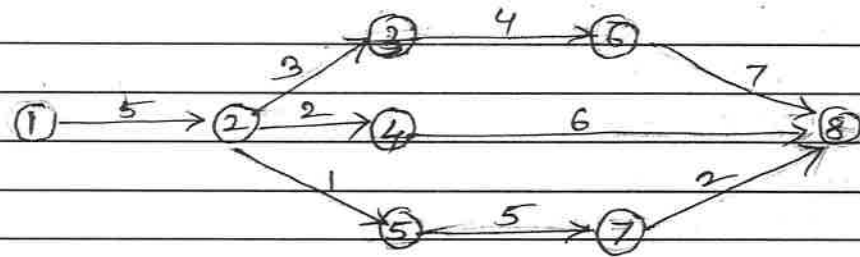
- 3 marks

2

2

Q2 (i)

(b)



- 3 marks

Critical Path 1-2-3-6-8

- 1 mark

duration 19 days

- 1 mark

(iii) Three time estimates

- 10 marks

Q3 (i)

The game does not have a saddle point. - 1 mark

B's pure strategy A's expected payoff

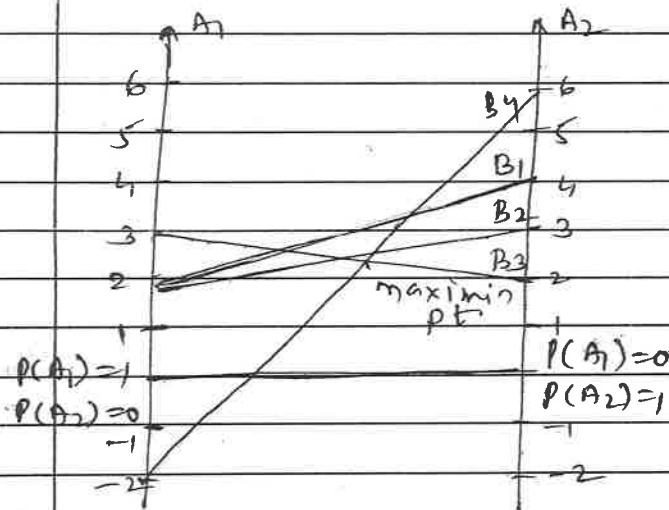
B<sub>1</sub>  $2p_1 + 4p_2$

B<sub>2</sub>  $2p_1 + 3p_2$

B<sub>3</sub>  $3p_1 + 2p_2$

B<sub>4</sub>  $-2p_1 + 6p_2$

- 2 marks



- 3 marks

Player B must choose B<sub>3</sub> & B<sub>4</sub>

	B <sub>3</sub>	B <sub>4</sub>
A <sub>1</sub>	3	-2
A <sub>2</sub>	2	6

$E_3 = E_4$

$E_3 = E_4$

3

3

$$3p_1 + 2p_2 = -2p_1 + 6p_2$$

$$p_1 = 4/9$$

$$p_2 = 5/9$$

} - 1 mark

$$q_1 = 8/9$$

$$q_2 = 1/9$$

} - 1 mark

$$\text{value of the game} = \frac{22}{9}$$

- 2 marks.

3. (ii)

Dominance property

- 8 marks

value of the game formula

- 2 marks.

(iii)

(a) Rules for determining saddle point - 3 marks

$$\text{maximin value} = 1$$

$$\text{minimax value} = 2$$

If maximin value = minimax value = 0, then game is a fair game.

Here, Game is not fair

- 2 marks.

(b)

1. strictly determinable game

- 2 marks.

2. pure strategy

3. mixed strategy

} - 1 1/2 marks each.

4. (c)

Decision making under risk

- 10 marks

(i)

	Acts			Regret table - 2 marks		
	$s_1$	$s_2$	$s_3$	$s_1$	$s_2$	$s_3$
$M_1$	800	500	300	0	300	500
$M_2$	350	300	100	0	50	250
$M_3$	400	550	0	150	0	550
min	350	300	0	150	300	550

$$\text{maximin} = 350$$

-  $s_1$  is the best act

- 3 marks

$$\text{Laplace } 516.67 \quad 450 \quad 133.33$$

-  $s_1$  is the best act

- 3 marks

minimax regret

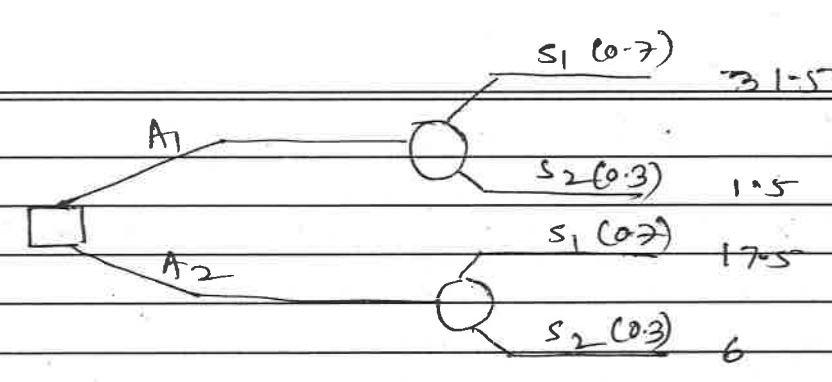
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$s_1$  is the best act

- 2 marks

(4)

Q 4. (iii)  
(b)



EMV A<sub>1</sub> = 33  
EMV A<sub>2</sub> = 23.5

5 marks

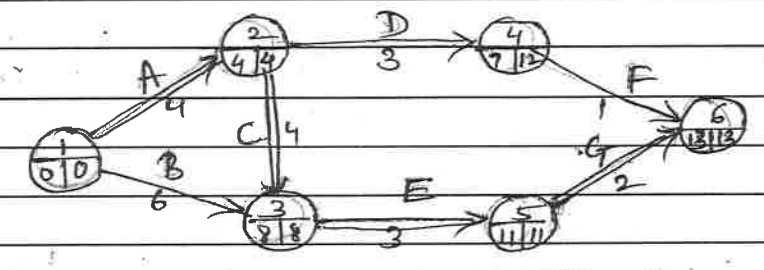
max EMV = 33  
∴ A<sub>1</sub> is the best act.

1 mark

(a) EVPI

4 marks

Q 5. (i)



Critical Path A-C-E-G  
Duration = 13 days

Activity	EST	EFT	LST	LFT	Total float
A	0	4	0	4	0
B	0	6	2	8	2
C	4	8	4	8	0
D	4	7	9	12	5
E	8	11	8	11	0
F	7	8	12	13	5
G	11	13	11	13	0

Network — 3 marks

Critical Path — 1 mark

EST, EFT, LST, LFT — 4 marks

Total float — 2 marks

5

5

Q. 5. (ii) Reduction of two person zero-sum game — 10 marks  
as a LPP

(iii) Events ↓	Acts →				Prob.	EOL			
	1	2	3	4		1	2	3	4
A	0	20	65	70	0.3	0	6	19.5	21
B	250	330	150	0	0.6	150	198	90	0
C	260	200	0	150	0.1	<u>26</u>	20	0	15
						176	224	109.5	36

min. EOL = 36

Best act is act 4

Regret table — 3 marks  
calculation of EOL — 2 marks  
Best act — 1 mark

6