## Question1—a and b

Question!  (a) Utalization of CPU: $O(u) = \frac{47295}{900000000000000000000000000000000000$		
Utalization of Disk: U(d) \$4005  Throughput of system $X(0) = \frac{C(c)}{54005}$ Throughput of system $X(0) = \frac{C(c)}{54005}$ Service demand of $CPV: D(c) = \frac{676}{5400} = 0.125$ Service demand of $Disk: D(d) = \frac{0.475}{200} = \frac{0.475}{0.125}$ $= 3.8$ (b) I think it is impossible to determine the bottleneck of the system without coloulating the		
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Service demand of CPV: $Voc) = \frac{X(0)}{X(0)}$ Service demand of Disk: $Pod) = \frac{V(d)}{X(0)} = \frac{0.475}{0.175}$ $= 3.8$ (b) I think it is impossible to determine the bottleheak of the system without calculating the system without calculating the	0	= 4/29 = 0.875/
Service demand of CPV: $Voc) = \frac{X(0)}{X(0)}$ Service demand of Disk: $Pod) = \frac{V(d)}{X(0)} = \frac{0.475}{0.175}$ $= 3.8$ (b) I think it is impossible to determine the bottleheak of the system without calculating the system without calculating the	-	Utalization of Disk: U(d) 54005
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Service demand of CPV: $Voc) = \frac{X(0)}{X(0)}$ Service demand of Disk: $Pod) = \frac{V(d)}{X(0)} = \frac{0.475}{0.175}$ $= 3.8$ (b) I think it is impossible to determine the bottleheak of the system without calculating the system without calculating the		The state of the contract of t
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Service demend of Disk: Dids= 0.475  = 3.8.  (b) I think it is impossible to determine the bottleneds of the system without calculating the		Caravice demand of CPU: Doc) = VIII
Service demend of Disk: Dids= 0.475  = 3.8.  (b) I think it is impossible to determine the bottleneds of the system without calculating the	5	0.875Z
(b) I think it is impossible to determine the bottleneck of the system without calculating the		(S+5) x = 10/12 = 1.475
(b) I think it is impossible to determine the bottleneck of the system without calculating the		Service demend of Disk : Prob = (a) = 0.125
(b) I think it is impossible to defermine the bottleneck of the system without calculating the		418) x X = -3.8
Cottleneck of the system without calculating the		
Cottleneck of the system without calculating the	0	(b) I pl. L is immedate to decoming the
160 course the Sexual demonde attemno	+	1 Think It is impossible to betermine the
the highest demands of whole system. Then requests ove more likely stuck in the highest demands device.  Then It could be the bottle neck.	1	1/20 course the Soviet demonde attempto
Then it could be the bottle neck.		the highest demands of whole system. Then requests
Then it could be the bottle neck.	0	eve more likely stuck in the highest demands device
		Then it could be the bottle neck.
	-	
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	0	

## Question1-c and d

(Vicestion) - 1 N - INTER
(c) X(o) < min [maxpo, Exp]
Max 12 = Dec 7 meno 0,148
Halization of Miste (101) 5405
M4.0 -2 -20085 -2 /
$\frac{Z}{\sum_{i=1}^{K}D_{i} = 7+3.8} = \frac{Z}{10.8} = \frac{1}{5.4} = 0.185$
the state of the s
As a result X (0) < min [0.143. 0.185]
25/0= 010/
The bound = x(10) < 0.143
E240 W
(d) $M = \chi_0 \times (Z + R)$
Corrido demand at 12th . 1212- Class arriva
$= \times \times (31+R)$
$= 0.143 \times (31 + 10) \times 30$
4 /77
I this is a investigation for the first
hadren to the cast a feel of the
actioned of the system inthost consistent to
and in the same of same of special or special
the withest elements of himle shall has been as
ove more thely study in the highest domate all
Then it could be the totale note.

## Question 2 a and b

Question 2:
Go U= B  Becourse M=10 So time to process a request in  System 1 is Ti = To The some for system 2: in = 15
Because M=10 So time to process a request &
System 1 is The some for sustem >:
Assume total comount of request that system process is  No for system 2 is IVz  Then Bi - Ni X to Bi - Ni X is
No Systam 2 is Nz
Then B, = N, X = B= N, X15
Deceuse 0= 7   remain the same for system 12
Because $U=\frac{R}{7}$ Tremain the seme for system 1.2. I-) make $U_1=U_2$ then $B_1=B_2$ . So $\frac{N_1}{10}=\frac{N_2}{15}$
N:1/5=2:3
So the Pil-P chould also Too 2:3
So the P:1-P should also be 2:3 As a result P-0.4.
JESS OF THE PARTY
Then the conclien a min made
(b) Mean respose time t for w/i/1  1, = 04 x2 = 8
1 = 04 XW=8
for system ! = ultp = 108 = 0.5 = 2
for systems. T= u(1p) = 15-12 3
Tm = = 1 x 0.4 + \$ x 0.6 = \frac{1}{5} + \frac{1}{5} = \frac{2}{5} = 0.4

## Question 2 c

- Kuestient :
(1) F 1 2 - 2 x20 D - 72-78
(C) For system 1 1 = PX20 R = 70-20
System2 12- (1-P)X20 R, = 15-4/1/X20
11 15
Accomp to the transmission of the contract of any
T=P-+1-P- 10-20P+15-4P1×20
1= 1-2-12
10-10f 15-47220
> 1-P
Non we nant to minimize T= To rop + 15-20+20p
The rest to minimum to 1 10 mg 1) without
I I-P
= for tops
= 41 - 2741 where 05 PS)
= 1 41 - 2 P4/ where 05 PS/ - 8P2+6P-1
As a restite of should be 0.3876  then the equation is minimized.
the result of smoule be 0,58/6
Then the equation is minimized
(b) Mean respire time of for 11/11/1
A C OH XZUEP
April 1 toustake 10
Q-
to support the
al-y show it
1- 1x0x+++0x1-1
THE STORY OF THE

## Question 3 a and b and c

	Question 3, $u = Exponential Service time$
0	Question 3 / M= 60 M= 60 M= 90 M= Exponential Service time for frequence
0	State transition diagram for the Markor Chain
	Systam (B) Machines  Systam (B) Machines  Systam (B) Machines  Systam (B) Machines
	12 1 D
	221 Jhome 32
	(2,1,0) 3)1 Jul 14
0	4M Juy m
	Be required
	uachme.
0	(0.00), (1.01), (1.10), (2.1.1) (3.1.1), (4.1.1)
	Then using -> symbol to molicete the transition between
	States and add the A, M, Mt (gans, thon rates)
0	6) 1. 4NP (0.0.0) -M+P (1.0.1) = 0
	2. (3/+M+) P(1,0,1) - 4/P(0,0,0)-MP(2,1,1) = 0
	$\frac{2}{3} \cdot \frac{(3)+(1+)}{(2)+(1+)} = 0$ $\frac{3}{3} \cdot \frac{(2)+(1+)}{(2)+(1+)} = 0$ $\frac{3}{3} \cdot \frac{(2)+(1+)}{(2)+(1+)} = 0$ $\frac{3}{3} \cdot \frac{(2)+(1+)}{(2)+(1+)} = 0$
	4. (1+11+11) P(3.1.1) - (4.1.1) - 2/ P(2.1.1) = 0. 5. (4.1.1) P(4.1.D- N 3.1.1) = 0.
	6. (M+3/) P(1.1.0) - (7/.1) = 0.
	7. P(0.0.0)+ P(1.0.1)+ P(2.1.V+P(1.1.0)+ P(3.1.V+P(4.1.V=).
0	(c) P(0,0,0)=0.5918 P(4.1.1)=0.0073
•	P(1,0,1) = 0.3081 $P(1,0) = 0.0004$
	P(2.1.1)=0 0313 P(3.1.1)=0 0611

# Question 3 d, e and f

Duck 3
6h Dand de
(d) PC Gt least three available) = P(0.0.0) + P(1.0.1) +P(1.0)
= 0.004 + 0.59/8+0.308)
= 0,9003
CHID Sustant of Marin
1 Month 1
(e) Mean number of failed markine:
1xP(1.0.1)+ 1xP(1.1.0)+2xP(2.1.1)+3xP(31.1)
+4x P(4.1.1) +0x P(0.0.0)
= 0.38/X1+ 0.0004X1+0.0073x4+0.06/1X3
+0.0313x2
= 0.308540.0292 + 0.1833 +0.0626
Con a Die
= 0.5836.
f) Mean time to repair (MTTR)
VI RIEUM TIME to repair (M/IR)
= Quarrier sin + 1 1
= Queueing time + Actual repair time
=. 0.3081 × 90 + 0 0312× (60+0-)
=. 0.3081 × 90+ 0.0313× (60+90) + 0.061 × (0x2+60) + 0.0073 × 60+90+1×2 + 0.0004×60
the state of the s
= 82.2 mins
3 (3.White has the house of the
C. CHAPPEREN ROWS
The complement of the property