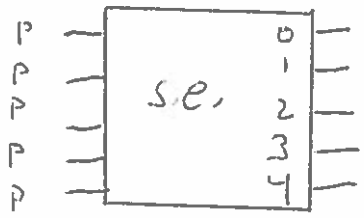
Name:_____

ESE/CSE 346 Midterm Fall 2018 Robertazzi

Answer all questions. Q1: 6 points, Q2 and Q3: 5 points each, Q4: 4 points, Total is 20 pts

1. A switching element had 5 inputs and 5 outputs. In a slot a packet arrives to each input with independent probability p and in a slot doesn't arrive to each input with independent probability 1-p. There is an output packet from output i if a total of i packets arrive in a slot to all inputs (for instance output 2 only produces a packet if exactly 2 packets arrive to the inputs in a slot).

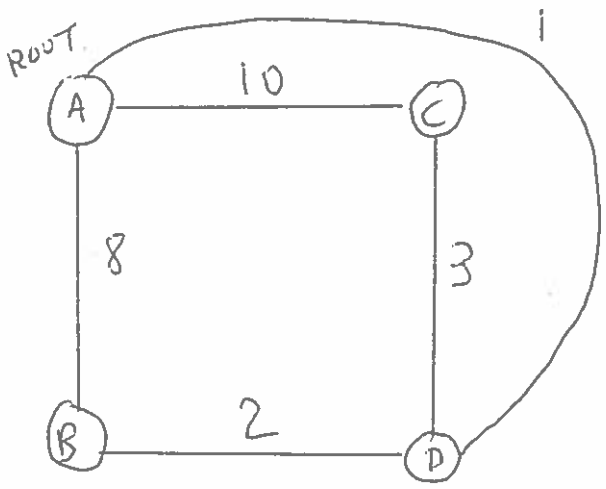
a) Write an expression for the probability that there is a packet at output 3.



b) Write an expression for the probability that there is a packet at output 0, 1 or 2.

2. A 1 bit Hamming error correcting code is used at the transmitter. Find the check bits if the message is 0011. Use even parity. Show work!

3. Create the shortest path algorithm routing table using the Dijkstra algorithm. Node A is the root node. Label the columns B C D from left to right.



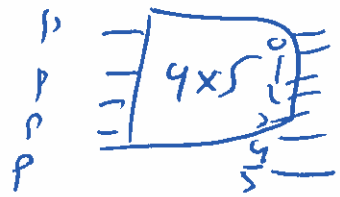
Brief answers:

4. (a) Why/how do geostationary satellites seem to hover in the sky in one spot and not "fall down"?

(b) Match:

1. Cellular system	[a] 36,000 km
2. Geostationary satellite	[b] Hand off
3. Fiber Optics	[c] Single mode and Multi-mode

(1)



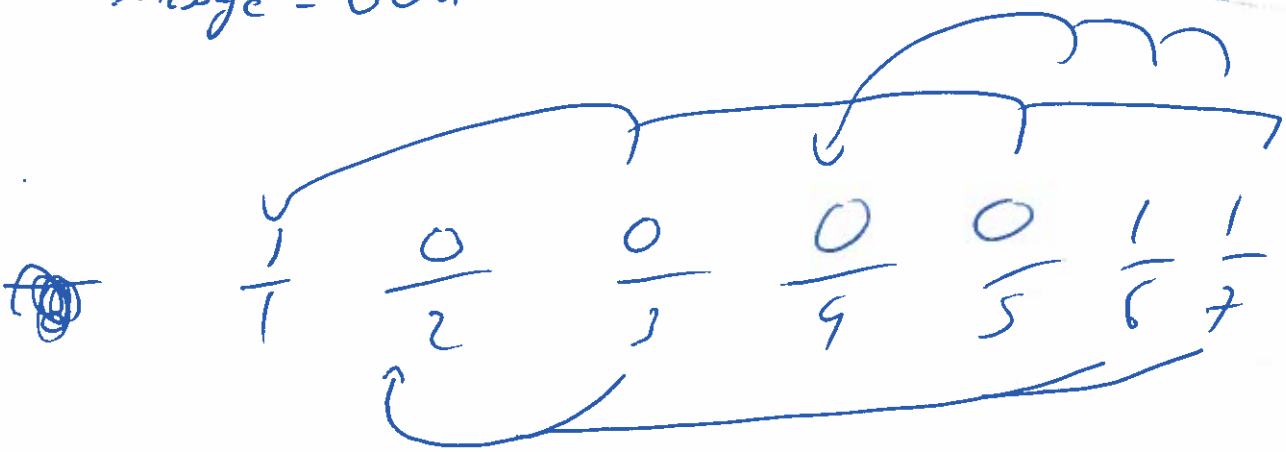
(a) Prob (packet at output 3) = $\binom{5}{3} p^3 (1-p)^2$

(b) ~~Prob~~ Prob (packet at output 0) = ~~$(1-p)^4$~~

~~$= \binom{4}{0} p^0 (1-p)^4$~~

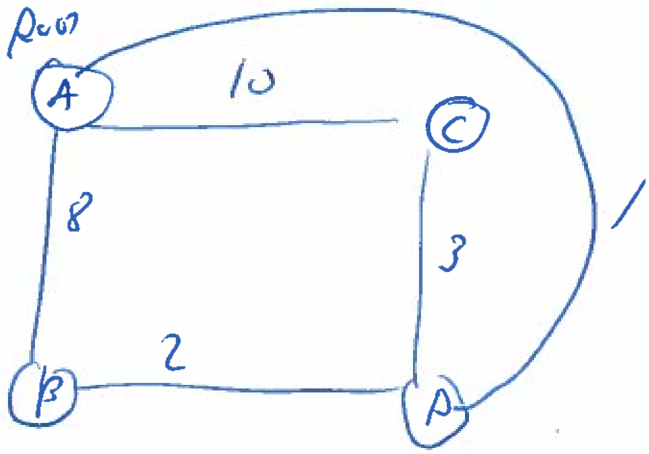
(c) Prob (packet at output 3 or less) = $\binom{5}{1} p (1-p)^4 + \binom{5}{2} p^2 (1-p)^3 + \binom{5}{0} p^0 (1-p)^5 +$ ~~$+ \binom{5}{3} p^3 (1-p)^2$~~

(2) Message = 0011



Check bits = 100

(3)



	N	B	C	D
1	{A}	8	10	1
2	{A,D}	3	4	(1)
3	{A,D,B}	(3)	4	1
4	{A-D}	3	(4)	1

(4) (a) Why does geostationary satellite hover in sky

(rotates around equator at same angular speed as earth)

(b) Cell System → Handoff

Geostationary Sat → 36 km

Fiber Optics → Single Mode / Multi Mode