Name: _____

Exam 1 | ESE 346 | Fall 2023 | Robertazzi

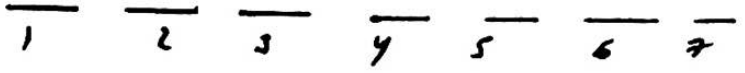
Answer all questions.

1. Consider a switching element with three inputs and two outputs. Sketch this. Time is slotted and slot boundaries line up across all inputs and outputs. The independent probability of a packet arrival at an input in a slot is p.
   If one input arrives it goes to one of the outputs randomly. If two packets arrive each output gets a packet. If three packets arrive two are randomly chosen to go to the outputs and one is dropped/erased.

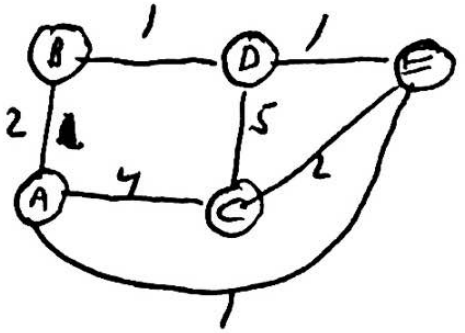
   (a) Write an expression for the probability of 1 or 2 arrivals.

   (b) Write an expression for the throughput at the output.

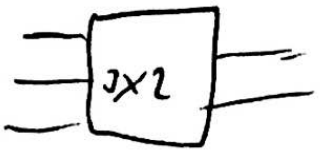
2. Using a Hamming code, find the check bits if the message is 0011 from left to right. Use even parity. There are 4 message bits and 3 check bits (total is 7 bits).



3. Let node A be the root. Create the Dijkstra algorithm table similar to what is in the book. Just include distances to the root, not pointers. If you use a technique not in the book you will not receive any credit.



ese 346



(a) Prob (1 or 2 arrivals) =

$$\binom{3}{1} p(1-p)^2 + \binom{3}{2} p^2(1-p)$$

(b) Throughput

$$\Sigma n p_n = 1\binom{3}{1} p(1-p)^2 + 2\binom{3}{2} p^2(1-p) + 2p^3$$

M(x) = 0011

check bits = 100

	N	B	C	D	E
1	{A}	2	4	∞	1
2	{A,E}	2	3	2	(1)
3	{A,B,E}	(2)	3	2	1
4	{A,B,D,E}	2	3	(1)	1
5	{A-E}	2	(3)	2	1