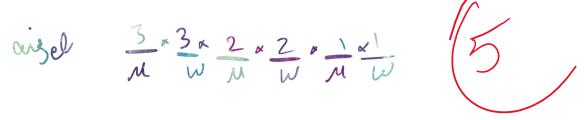
## CS 198:206

Exam II Name & Section:----

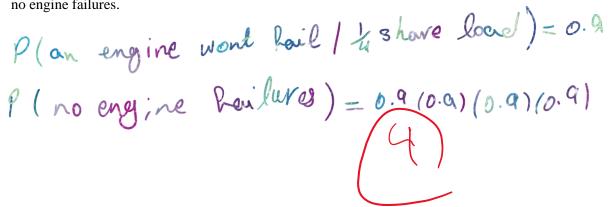
- The approximate time required to complete this exam is 60 minutes.
- For full grade, show and write all your work, step by step. No work/Just final answer has no point.
- To avoiding any missing or mistake, please read the question carefully and completely.
- You get 2 points deduction if you submit a paper without name.
- In case if you need more space, you might use the back side of your paper. I **DO NOT ACCEPT** any other sheet attached to the exam paper.
- **Do NOT USE** calculator or any electronic device.

Q 1. (5 Points) Arne, Bobbette, Chuck, Deirdre, Ed, and Fran have reserved six seats in a row at the theater, starting at an aisle seat. In how many ways can they arrange themselves if the men and women are to alternate seats and a man must sit on the aisle? Arne, Chuck, and Ed are men, and the others are women.



**Q 2.** (8 Points: 4 points each) In a certain four engine vintage aircraft, now quite unreliable, each engine has a 10% chance of failure on any flight, as long as it is carrying its one-fourth share of the load. But if one engine fails, then the chance of failure increases to 20% for each of the other three engines. And if a second engine fails, each of the remaining two has a 30% chance of failure. Assuming that no two engines ever fail simultaneously, and that the aircraft can continue flying with as few as two operating engines, find each probability for a given flight of this aircraft.

a) no engine failures.



b) exactly two engine failures (any two of four engines)

P(an engine wont hail  $\frac{1}{2}$  share hond) = 1-0.3 P(2xodly 2 engine hailures) =  $\binom{4}{2}(0.1)(0.2)(0.7)(0.7)$ 

**Q 3.** (**5 Points**) The probability that a visit to a particular car dealer results in neither point second-hand car nor a Japanese car is 55%. Of those coming to the dealer, 25% buy second-hand car and 30% buy a Japanese car what's the probability that a visit leads to buying a second-hand Japanese car?

Let A be the event of buying a second hand car and B of buying a japanese car. In the problem it is given that  $P(\bar{A}\cap\bar{B})=0.55,\ P(A)=0.25$  and P(B)=0.3. We are asked to calculate  $P(A\cap B)$ . We know that  $P(A\cup B)=P(A)+P(B)-P(A\cap B)$ . Moreover,  $P(\bar{A}\cap\bar{B})=P(\bar{A}\cup\bar{B})=1-P(A\cup B)$ . Hence,  $P(A\cup B)=0.45$ . Thus,  $P(A\cap B)=0.25+0.3-0.45=0.10$ .

**Q 4.** (6 Points) Three urns are there containing white and black balls; first urn has 3 white and 2 black balls; second urn has 2 white and 3 black balls and third urn has 4 white and 1 black balls. Without any biasing one urn is chosen from that one ball is chosen randomly which was white. What is probability that it came from the third urn?

 $A = W \text{ hite bold is drawn} P(v_3) P(A|v_3) P$ 

- **Q 5.** (6 Points; 4 and 2 points respectively) college foundation raises funds by selling raffle tickets for a new car worth \$36,000. If 600 tickets are sold for \$120 each, determine each of the following.
- (a) The expected net winnings of a person buying one of the tickets

 $E(x) = (36000 - 120) + (-120)(\frac{599}{600}) = -\$60$ 

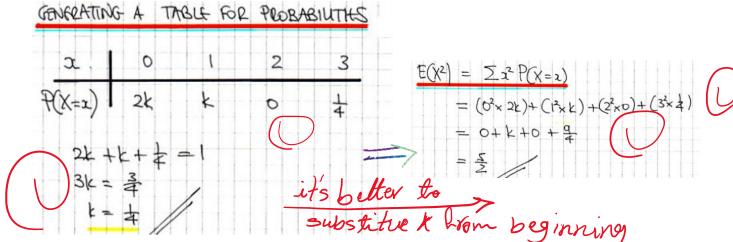
(b) The total profit for the foundation, assuming that the car was donated.

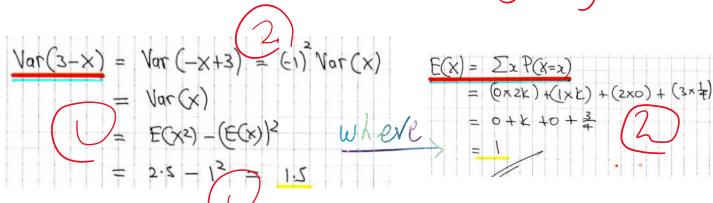
Since car is hree = total prolit: 600 (120) \$ \$72000

Q 6. (10 Points) The probability distribution of a discrete random variable X is given by

$$P(X = x) = \begin{cases} k(2 - x) & x = 0, 1, 2\\ \frac{1}{4} & x = 3\\ 0 & Otherwise \end{cases}$$

- a). Find E( $X^2$ )
- b) Determine Var(3 X)





**Total: 40 points**