BA3320 Fundamentals of Production

EXAM 1 Winter 2005 Dr. Banis

NAME:
Section time:

Closed book, One page of notes. No team efforts. Consistent supporting calculations may be required for credit.

total 300 points

I

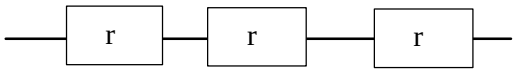
1) The practice of working overtime while slacking off during regular working hours:

1. the minimax regret strategy.
2. the bologna sandwich technique.
3. the salami technique.
4. decision trees.
5. factor rating.
6. Ben Franklin's balance sheet approach.

2) The "Trunk Monkey" was shown as a possible example of

1. Customer-focused quality
2. Product failure half-life
3. Prisoner's Dilemma Model
4. Calculated Breakeven
5. Sensitivity Analysis
6. The Salami Technique in negotiation
7. Tit-for-tat strategy
8. Situational Optimism
9. The Golden Rule in TQM

3) A system has three identical components, with the same reliability. All three must work for the system to work. If you need an overall system reliability of about 0.729, what must the reliability of the individual components be?



1. 0.1706667
2. 1.536
3. 0.9
4. 0.857
5. 0.95
6. 0.98

4) In SPC, the number of defects per piece are tracked using:

1. A variometer invented by Cosby in 1973
2. The X-bar chart
3. The R-chart
4. The P-chart
5. The C-Chart
6. The Z chart
7. The pinPoint Table

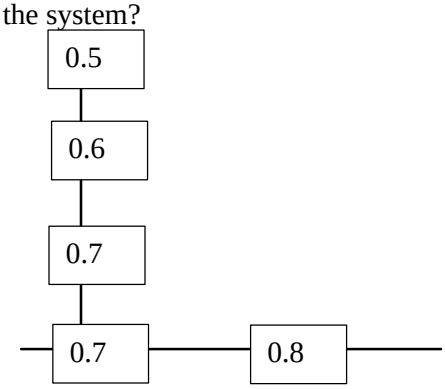
5) A process filling beer bottles gives mean volume of 32 ounces with a standard deviation of one ounce. If samples of 16 bottles (n=16) are tested for the X-bar chart and three sigma limits are used, what are the upper and lower control limits on the chart?

UCL=

LCL=

Total = 60

II A) Here is a system with 2 components, one of which has three backups. Some of the backup parts are a little less likely to work. The diagram looks like this, with the reliabilities indicated. What is overall reliability of the system?



1. 0.7856
2. 1.7
3. 1.5
4. 0.947
5. 0.728
6. 0.5
7. essentially 100%

2) You are selling Printers that have normally distributed lifetimes (before needing major service) with a mean of 6 years and standard deviation of 3 years.For those printers, instead of a warranty, you are selling a six-year service contract. If the average cost of a repair that would be covered by this contract is $100, how much should you charge for the whole six-year service contract to break even? Assume there is no other coverage for service, such as a warranty.

1. $100
2. $50
3. $14.95
4. $69
5. The printers won't break down until they are more than 9 years old

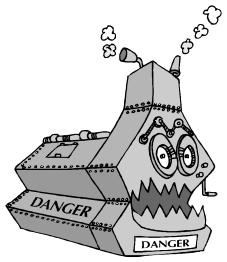
3) The Moldybog frog company raises frogs for fraternity parties. Maintaining the Bog involves fixed costs of $100,000 per year. In addition, it costs 50 cents for each frog produced, including food, labor to catch them, laundry, etc.. Moldybog could buy an automated frog bagger that would reduce laundry bills so that unit variable cost is only 30 cents, but raising fixed cost to $150,000 per year. Calculate what volume would make you indifferent about the Investment. (no credit for answers without calculations).

Frogs per Year

4) To reduce labor costs, many companies change out all light bulbs at the same time (relamp) when bulbs are old enough to be less reliable, rather than replacing them as they burn out. A new type of industrial light bulb lasts on average 5,000 hours before it has to be replaced. This lifetime is normally distributed with a standard deviation of 200 hours. Approximately how often should you relamp so that there are likely to be more than 85% of the lights still working?

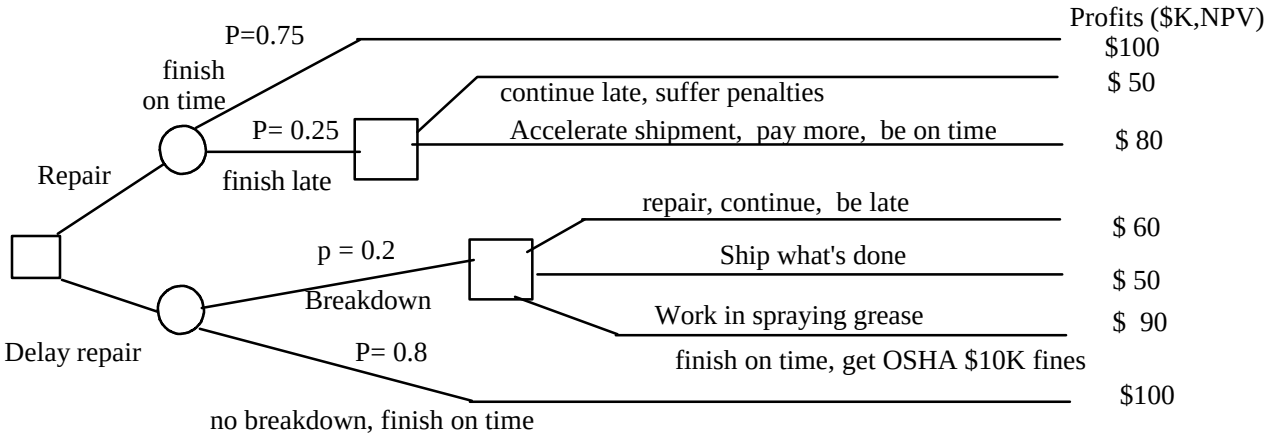
1. 4250 hours
2. 750 hours
3. 950 hours
4. 1052 hours
5. 4800 hours
6. 5,200 hours
7. 42,500 hours
8. 948 hours
9. $14 * 10^6$ light-years
10. 1042.5 hours
11. 12.44 years
12. 57%

Total = 60



III There is a large and lucrative production run scheduled. The equipment is old and ready to break down. If you take time now to repair it, there is a 25% probability of not finishing the product on time and having to pay to accelerate delivery or suffering a penalty. If you don't repair the equipment before starting, there is a 20% chance of breakdown which could delay the finish and give a late penalty, unless you have people work overtime under conditions that would have them sprayed with grease. OSHA would fine you $10 K for doing this to the employees.

This case gives the following decision tree with the Net Present values for each alternative at the terminal nodes:



a) Calculate expected profit for each alternative. Show decisions and expected monetary values at branch points. If you only care about EMV, would you repair the equipment ahead of time or delay the repair?

Be Careful!
Accidents cause
paperwork.

b) How much would it be worth to you to know ahead of time (perfect information) whether or not the unrepaired equipment would break down during the run?

1. $1 K
2. $3 K
3. $ 5 K
4. 0
5. $10 K

c) The current payoff for continuing with broken equipment in spraying grease is $90K--The $100K received for delivering the goods on time less the $10K OSHA fine for endangering the employees. What is the minimum OSHA fine that would eliminate monetary incentive (break even) for the company to endanger the employees?

1. $10 K
2. $40 K
3. $25 K
4. $3 K
5. $100 K

We treat our employees like dirt
and pass the savings on to you.

Total = 60

IV

HiQ Manufacturing Company buys manufacturing supplies from the Jones Company. For many years HiQ was run by it's founder, A kindly old gentleman who believed all that schmaltsy stuff sabout TQM and Deming's 14 Points. Now his son has taken over, and his son considers himself a little more "street smart" than the old man.

The son has been exposed to game theory and things you'd better watch out for what people might do unto you.

He knows that some suppliers will take advantage of "nice guys" and cut corners on quality to boost their own short term profits. Quality of the final product is affected by quality of the parts, and higher quality work gives more total profit.

There are three stategies the boss can pursue:

1. Overpay the supplier and hope they will perform exceptionally;
2. Pay the standard rate, expecting them to live up to the agreement;
3. Underpay ("strike a hard bargain") to allow for the fact that they will probably have to fix things.

Likewise, Jones can adopt one of three strategies:

1. Do excellent, thorough work;
2. Meet the minimum specifications;
3. Cheat on quality and cut corners to increase short term profits.

HiQ controls which row will be picked. Jones controls which column.

Use squares for HiQ and circles for Jones to show which strategies would prevail if each party only chose to maximize short term gain. How much would each make in the stable solution?

Short term Profits in $M as a function of Pay and quality performance

HiQ / / Jones	lowQ/ shoddy	Minimum	Thorough/ excellent	Jones' Maximum Profit
underpay,hardball	10 / / 25	45 / / 22	85 / / 20	
Pay average rate	5 / / 30	50 / / 27	90 / / 25	
overpay/reward	0 / / 33	43 / / 35	80 / / 30	
HiQ's Maximum profit				

(please note if you end up with a stable solution of rewards and excellence, you've done it backwards--life doesn't work that way.)

Show, by drawing lines through those rows and columns, which strategies are dominated and wouldn't be pursued in any case.

What would be a better solution for them both? If they think about it, do they have incentives to maintain that better solution?

Total = 60

V

Briar Patch Dolls and the mystique of scarcity.

Economics of the fad toy business can be pretty weird. Companies can sometimes make a killing from an engineered scarcity. Assume the following payoff table for the thorny problem of Briar patch Dolls:

Which alternative would maximize Expected Monetary Value (EMV) ?
Which alternative would you choose under: the Maximax (optimist) strategy ?
the Maximin (pessimist) strategy ?

Total profit as a function of how many dolls are manufactured ($M)

	Total profit ($M)					
Popularity	low	moderate	bonkers	EMV	Optimist	Pessimist
Probability	0.4	0.5	0.1			
Few	2	5	100			
a lot	4	10	70			
tons	2	4	50			
EMVc						

What is the most you would pay for perfect advance information about the market for each new doll?

Which would you choose under the Minimax regret strategy ?

	Regrets ($M)			
Popularity	low	moderate	bonkers	Max regrets
few				
a lot				
tons				

What is the difference in expected profit for following an EMV strategy vs. Minimax Regret in this case?

Total = 60