

BA3352 : Midterm on 29 October 2002 - **VERSION B**

This is a closed textbook and lecture notes exam. You can use a calculator but also can leave quantities as fractions, additions or products. **Do not forget** to define any variables you introduce. **Write your exam version on your scantron paper.** Good luck.

I declare that my conduct during the exam is entirely within the limits of the UTD regulations governing scholastic honesty -detailed in the handbook of operating procedures Title V Chapter 49.

NAME (please print): _____

Question	Total possible	Actual
Q1	72	
Q2	13	
Q3	15	
Total	100	

Formulae:

Forecasting: Exponential Smoothing. $F_t = \alpha A_{t-1} + (1 - \alpha)F_{t-1}$

Double Exponential Smoothing. $F_t = \alpha A_{t-1} + (1 - \alpha)F_{t-1} + T_{t-1}$ where $T_{t-1} = \beta(F_{t-1} - F_{t-2}) + (1 - \beta)T_{t-2}$

Variance Formula for random variable X : $Var(X) = \frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N}$

Linear regression: $y_n = a + bx_n$ for N data points where

$$b = \frac{N \sum xy - \sum x \sum y}{N \sum x^2 - (\sum x)^2} \quad \text{and} \quad a = \frac{\sum y - b \sum x}{N} \quad \text{also} \quad r = \frac{N \sum xy - \sum x \sum y}{\sqrt{N \sum x^2 - (\sum x)^2} \sqrt{N \sum y^2 - (\sum y)^2}}$$

Exponential lifetime random variable X with rate λ has density $\lambda e^{-\lambda T}$ at point T .

Also $P(\text{Lifetime} \leq T) = 1 - e^{-\lambda T}$ and $P(\text{Lifetime} \geq T) = e^{-\lambda T}$.

Minimum number of stations = $\sum t / CT$

Control charts:

$$UCL = \text{Average of Sample Means} + z \cdot \text{StDev of Sample Means}$$

where we choose z so that Type I probability, denoted by α .

$$\text{For p-chart with sample size } n \text{ StDev of Sample Mean} = \left\{ \frac{\bar{p}(1 - \bar{p})}{n} \right\}^{0.5}$$

$$\text{For c-chart StDev of Sample Mean} = \{ \text{Average of Sample Means} \}^{0.5}$$

Let r be the number of runs in K samples:

$$\text{Expected value}(r) = \frac{2K - 1}{3} \quad \text{StDev}(r) = \left\{ \frac{16K - 29}{90} \right\}^{0.5}$$

Q1: Choose the most appropriate answer and mark your answer on the scantron paper.

1. The type of processing system that is used for complex jobs with unique sets of activities is:

- (a) continuous
- (b) intermittent
- (c) project
- (d) batch
- (e) mass

C

2. In which type of operations are you likely to see minor variations in the product or service being produced using the same process and the same equipment?

- (a) a project
- (b) a job shop
- (c) repetitive production
- (d) batch processing
- (e) none of the above

D

3. At the break-even point:

- (a) total cost is minimized
- (b) output equals capacity
- (c) total cost equals total revenue
- (d) total cost equals profit
- (e) total profit is maximized

C

4. The type of layout which is used to achieve a smooth and rapid flow of large volumes of output is:

- (a) process
- (b) product
- (c) fixed-position
- (d) batch
- (e) unit

B

5. Remanufacturing is

- (a) Reusing the components of old products
- (b) Using reverse engineering to manufacture parts

- (c) Using reverse logistics to manufacture parts
- (d) Replacing the defective components with properly functioning components
- (e) Manufacturing components after redesigning them

A

6. Which of the following possible values of alpha would cause exponential smoothing to respond most (or fastest) to forecast errors

- (a) -1
- (b) 0.1
- (c) 0
- (d) 1
- (e) 0.5

D

7. Which one of the following is not a reason for model building?

- (a) Improved understanding
- (b) Improved communication
- (c) Higher abstraction
- (d) Experimentation
- (e) Standardization for analysis

C

8. Which of the following quality control sample statistics indicates a quality characteristic which is an attribute?

- (a) Mean
- (b) Variance
- (c) Standard deviation
- (d) Range
- (e) Proportion

E

9. A point which is outside of the lower control limit on an R-chart:

- (a) is an indication that no cause of variation is present
- (b) should be ignored because it signifies better than average quality
- (c) should be investigated because an assignable cause of variation might be present
- (d) should be ignored unless two more points are outside that limit
- (e) is impossible since the lower control limit is always zero

C

10. A shift in the process variance for a measured characteristic would most likely be detected by a:

- (a) p-chart
- (b) x-bar chart
- (c) c-chart
- (d) R-chart
- (e) a combined use of x-bar and R-chart

D

11. The purpose of control charts is to:

- (a) estimate the proportion of output that is acceptable
- (b) reject lots with too many defectives
- (c) determine if the output is within specifications
- (d) distinguish between random variation and assignable variation in the process
- (e) identify the causes of poor quality

D

12. The action of a professor asking his students to prepare exam questions is an example of:

- (a) continuous improvement
- (b) being a champion of exam preparation
- (c) benchmarking
- (d) worker empowerment
- (e) worker involvement

E

13. A fishbone diagram would be used to:

- (a) show the work flow
- (b) list potential causes of an effect
- (c) diagram the skeleton of a fish
- (d) show the structure of a quality circle
- (e) do Pareto analysis

B

14. Focusing attention on the most important problem areas is referred to as:

- (a) Continuous improvement
- (b) Quality assurance
- (c) Brainstorming
- (d) Pareto analysis
- (e) Cause-and-effect analysis

D

15. The cost of the preparation of quality control charts is an example of :

- (a) Internal failure costs
- (b) External failure costs
- (c) Appraisal costs
- (d) Prevention costs
- (e) Replacement costs

C

16. Which of the following is not an inspection point in manufacturing?

- (a) Raw materials and purchased parts
- (b) Finished products
- (c) Before a costly operation
- (d) Before a covering process
- (e) All of the above are inspection points.

E

17. A control chart used to monitor the process mean is the:

- (a) p-chart
- (b) R-chart
- (c) x-bar chart
- (d) c-chart
- (e) Ishikawa diagram

C

18. If the GMAT scores of graduate students at UTD is Normally distributed with mean 600 and variance 100, what percentage of students have scores below 500:

- (a) $\text{normdist}(500,600,100,0)$
- (b) $\text{normdist}(500,600,100,1)$
- (c) $\text{normdist}(500,600,10,0)$
- (d) $\text{normdist}(500,600,10,1)$
- (e) $1-\text{normdist}(500,600,100,1)$

D

19. If the GMAT scores of graduate students at UTD is Normally distributed with mean 600 and variance 100, what percentage of students have scores between 500 and 550:

- (a) $\text{normdist}(550,600,100,0)-\text{normdist}(500,600,100,0)$
- (b) $\text{normdist}(550,600,10,1)-\text{normdist}(500,600,10,1)$
- (c) $\text{normdist}(550,600,10,0)-\text{normdist}(500,600,10,0)$
- (d) $50*\text{normdist}(525,600,100,0)$
- (e) $\text{normdist}(550,600,100,1)-\text{normdist}(500,600,100,1)$

B

20. How many up-down runs should we expect from 14 samples?

- (a) 7
- (b) 8
- (c) 9
- (d) 10
- (e) 11

C

21. In a control chart, if we increase LCL and decrease UCL:

- (a) Type II error increases
- (b) Type I error increases
- (c) Type I and Type II errors both increase
- (d) Only Type III error increases
- (e) Type I, Type II and Type III errors all increase

B

22. If a cookie type has 100 chocolate chips on the average, what would be UCL and LCL of a $3\text{-}\sigma$ control chart for the number of chocolate chips:

- (a) 97-103
- (b) 88-112
- (c) 82-118
- (d) 76-124
- (e) 70-130

E

23. Which of the following is not a factor commonly considered in the make-or-buy decision process?

- (a) available capacity
- (b) expertise
- (c) nature of demand
- (d) cost
- (e) revenue

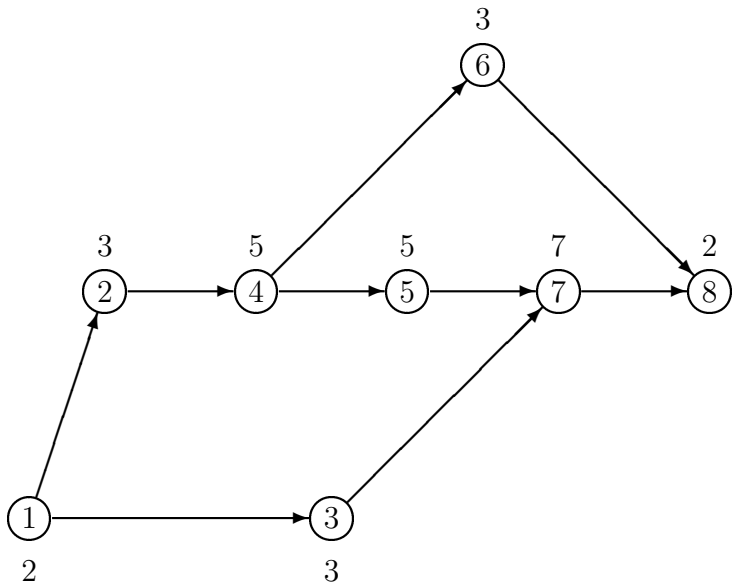
E

24. The type of processing system which is used for highly standardized products is:

- (a) continuous
- (b) intermittent
- (c) project
- (d) batch
- (e) unit

A

Q2. Suppose that a shop produces flower baskets at a rate of 240 per week by working 40 hours per week, and the operation sequences and durations (in minutes) are as given below:



a) Compute the cycle time (in minutes) and the minimum number of workstations required.

In order to produce 240 per week, produce 6 per hour or 1 unit every 10 minutes. Cycle time is 10 minutes. No formula is necessary to reason this out. Every 10 minutes one basket must be produced, each basket takes 30 minutes to process. Then at least 3 (=30/10) stations are necessary. No formula is necessary to reason this out.

b) Assign operations to work stations giving priority to those with more successors (break ties by giving priority to operations with larger operation times). How many work stations are required?

Workstation	Time Remaining	Eligible	Assign Task	Station Idle Time
1	10	1	1	0
	8	2,3	2	
	5	3,4	4	
	0			
2	10	3,5,6	5	2
	5	3,6	3	
	2			
3	10	6,7	7	0
	3	6	6	
	0			
4	10	8	8	8
	8			
				10

Q3. Two construction companies, A and B, are preparing bids to construct a new classroom building for UTD: UTD has a very specific design and companies bid to construct the design at the lowest cost. Neither of these companies knows how much the other one bids. UTD will chose the lowest bidding company and will pay the amount in the lowest bid as long as the amount is within the UTD's construction budget of 20 million dollars. When two companies bid the same amount, A is chosen as the winner. UTD works only with whole numbers in million dollars so all the bids must be made in millions and no fractions are allowed. For example, 17.5 million dollar cannot be a bid amount. If a company bids too much, it risks the chances of winning the bid. If a company bids too low, it risks the opportunity of making more money.

We will study how much A should bid for the construction. A knows the following about B's bid amounts and associated probabilities (M=million):

B	No bid	Bid \$16M	Bid \$18M
Probability	0.2	0.4	0.4

A spends \$3M to prepare for the bid and \$12 to construct the building. Unlike bidding costs, A incurs construction costs only if it wins the bid.

a) Explain why A should bid between 16 and 20 million dollars.

Below 15 million no profit is made, above 20 million UTD does not pay.

b) What are the alternative bidding amounts (A can make) and the possible scenarios (A can face)? Compute A's profit for each alternative and scenario pair. Put these numbers into a payoff table.

A	B	No bid	Bid \$16M	Bid \$18M
No bid		0	0	0
Bid 16		1	1	1
Bid 17		2	-3	2
Bid 18		3	-3	3
Bid 19		4	-3	-3
Bid 20		5	-3	-3

c) This part is independent of a or b. Compute MiniMax, MiniMin and MinAverage amounts for the **following** payoff table and find the corresponding alternatives (A,B,C or D). Suppose all the scenarios (1,2,3 and 4) are equally likely.

	1	2	3	4
A	-1	0	-2	1
B	4	3	2	1
C	-1	-2	-3	5
D	-2	2	-4	3

MiniMax=0 with A, MiniMin=-4 with D, MinAverage=-0.5 with A.