BITS , PILANI – DUBAI CAMPUS
KNOWLEDGE VILLAGE
COMPREHENSIVE EXAMINATION- 2004-2005

COURSE NO : AAOC UC 312
COURSE TITLE : OPERATIONS RESEARCH
DATE : 26.05.05
TIME : 3 HRS
MAX. MARKS : 40 WEIGHTAGE : 40%

1. The following random samples are measurements of the heat-producing capacity (in millions of calories per ton) of specimens of coal from two mines:

Mine 1:	8260	8130	8350	8070	8340	
Mine 2:	7950	7890	7900	8140	7920	7840

Use the 0.01 level of significance to test whether the difference between the means of these two samples is significant. (4 marks)

2. The following figures give the number of defectives in 10 samples, each containing 200 items:
40, 44, 22, 34, 24, 32, 28, 32, 34 and 30.
Use a suitable control chart for number of defectives and specify if the process is under control or not.

(5 marks)

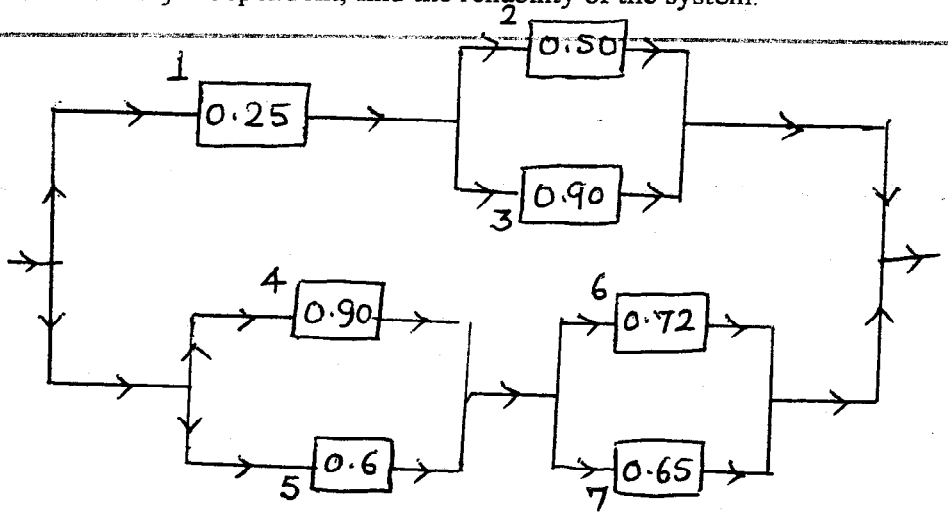
3. A large corporation wants to choose between two brands of light bulbs. Brand A is less expensive than Brand B. Hence the corporation would like to buy brand A unless there is a strong evidence to indicate that Brand B has a larger life. For this purpose, 7 bulbs of brand A were tested for their life- lengths(in hundred hours) and the following results were recorded as their life lengths:
10, 15, 17, 12, 15, 14, 13
and 9 bulbs of brand B were found to have the following life lengths
13, 14, 16, 18, 8, 7, 5, 19, 20.
Using the rank-sum test at a level of significance at most 0.05, what decision would be made? (4 marks)

4. A sample analysis of examination results of 200 MBA's was made. It was found that 46 students had failed, 68 secured a third division , 62 secured a second division and the rest were placed in first division. Do these figures commensurate with the general examination result which is in the ratio of 4 : 3 : 2 : 1 for various categories respectively? (4 marks)

5. Using the random numbers 0.75, 0.32, 0.65, 0.21, 0.22, 0.57 generate one observation of the binomial random variable X with $n = 6$, $p = 0.4$.

(2 marks)

6. Consider the system given below. The numbers inside the boxes are reliabilities and the numbers outside the boxes are component numbers. Assume that the components are mutually independent, find the reliability of the system.



(4 marks)

7. An automobile firm requires 100 units of an item every day. Shortage cost is estimated to be Rs.3/- per unit per day and the holding cost is Rs. 2/- per unit per day. The firm can either manufacture the items or purchase from an outside source. The set-up cost is Rs.1000/- for manufacturing and Rs. 60/- for purchase. A unit costs Rs.2/- if manufactured and Rs. 4/- if purchased. While the manufacturing rate is 300 units per day, the delivery is instantaneous if purchased. What should be the policy of the firm : manufacture or purchase? (5 marks)

8. A parking lot has 5 parking spaces of cars. Cars arrive, for parking at the lot, in Poisson process at the rate of 8 cars per hour. The parking time of a car is exponentially distributed with a mean of 30 minutes. When all the 5 parking spaces are occupied, then any car that arrives goes elsewhere for parking.
   (a) What fraction of cars, are lost as customers to this parking lot, i.e. go elsewhere for parking?
   (b) Find the mean number of cars parked at the lot.

(4 marks)

9. Four varieties of wheat A, B, C, D were sown on a block of land by dividing the block into 16 plots of equal size and using 4x4 Latin square design (chosen at random), in order to take into account the possible fertility gradients in the soil. The resulting yields in kilograms were found to be as follows:

Row positions of the plot	Column positions of the plot 1	2	3	4
1	C = 18	D = 12	A = 16	B = 20
2	D = 26	A = 34	B = 25	C = X
3	B = 15	C = 22	D = 10	A = 28
4	A = 30	B = 20	C = 15	D = 9

Test at 0.05 level of significance for the differences amongst the varieties.

(6 marks)