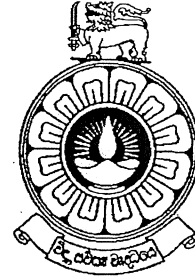


037

THE OPEN UNIVERSITY OF SRI LANKA
 MASTER OF TECHNOLOGY
 FINAL EXAMINATION - 2013/2014
 TTX7151 OPERATIONS RESEARCH
 OPEN BOOK TEST
 DURATION -THREE HOURS



DATE: 16 August 2014

TIME: 0930 - 1230 Hours

Answer any five (05) questions. All questions carry twenty (20) marks each.

1. A software development project has been defined to contain the following list of activities along with their required times for completion:

Activity No	Activity	Expected completion time	Dependency
1.	Requirements collection	5	-
2.	Screen design	6	1
3.	Report design	7	1
4.	Database design	2	2, 3
5.	User documentation	6	4
6.	Programming	5	4
7.	Testing	3	6
8.	Installation	1	5, 7

- a. Determine the expected completion time of each activity.
 - b. Determine the earliest expected completion time, the latest expected completion time and float of each activity
 - c. What is the total project completion time, and what are the activities on the critical path?
 - d. Determine the Standard Deviation of expected completion time of only those activities which are on the critical path.
02. a. An apparel manufacturing company has received an order to produce pants and jackets. The company has 750m^2 of cotton fabric and 1000m^2 of polyester fabric available in its store. Every pant will need 1m^2 of cotton fabric and 2m^2 of polyester fabric. Every jacket will need 1.5m^2 of cotton fabric and 1m^2 of polyester fabric.
- The price of pants is fixed at \$50 and the jacket at \$40. What is the number of pants and jackets that the manufacturer must produce to obtain maximum sale?
- b. A merchandiser has orders for 600 pieces of a certain garment from London and 400 garments from Manchester. The merchandiser has 700 garments in a warehouse in Oxford and 800 garments in a warehouse in Leeds. It costs £5 to ship a garment from Oxford to London, but it costs £10 to ship it to Manchester. It costs £15 to ship a garment from Leeds to London, but it costs £4 to ship it from Leeds to Manchester. How many garments should the merchandiser ship from each warehouse to London and Manchester to fill the order at the least cost?

03. a. An apparel manufacturer annually buys 18 million metres of fabrics every year. The cost of one procurement is LKR 10,000/= and the holding cost per million meter is 25% of the purchase price per month. The average purchasing price of the fabric is LKR 60/= per metre. Determine the following:

- i. The economic order quantity (EOQ)
- ii. The total cost with respect to EOQ
- iii. The number of orders per year
- iv. The time between consecutive two orders

b. A milkman sells milk at a profit of LKR 20/= per litre. If milk does not get sold on a particular day he would lose LKR 65/= per litre. Daily demand of milk has the following distribution.

Amount of milk sold in litres	400	410	420	430	440	450	460	470
Probability	0.05	0.07	0.08	0.20	0.30	0.15	0.10	0.05

If each day's demand is independent of the previous day, how many litres of milk should the milkman stock for each day?

04. a. Lanka Watchworks sells watches for LKR 5,000 each. During the next months, they estimate that they will sell 15, 25, 35, or 45 watches with respective probabilities of 0.35, 0.25, 0.20, and 0.20. They can only buy watches in lots of ten from their dealer. 10, 20, 30, 40, and 50 watches costing LKR 4,000/=, LKR 3,900/=, LKR 3,700/=, LKR 3,600/=, and LKR 3,400/= per watch respectively. Every month, Lanka Watchworks has a clearance sale and will get rid of any unsold watches for LKR 2,400/= (watches are in stores for a month as they have to buy the latest model each month). Any customer that

comes in during the month to buy a watch, but is unable to buy, costs LKR 600/= in lost goodwill. Find the best action under each of the four decision criteria.

- b. Two apparel retailers LankaApparels and LankaFashions have been involved in fashion business for number of years with similar products and in the same customer market. In one of the strategic meetings, the Marketing Manager of LankaApparels, wanted to know the decision of the management of the LankaApparels on the issue of advertising strategy based on the following data that has been made available by the market research team of the LankaApparels.
- i. No advertising, medium advertising and large advertising by both LankaApparels and LankaFashions will result in equal market share for both companies.
 - ii. If LankaApparels does not advertise, but LankaFashions does
 - medium advertising, LankaApparels will get 40% of market share;
 - large advertising, LankaApparels will get only 28% of market share.
 - iii. If LankaApparels does medium advertising, and LankaFashions does
 - no advertising, then LankaApparels will get 70% of market share;
 - large advertising, then LankaApparels will get 45% of market share.
 - iv. If LankaApparels does large advertising and LankaFashions does
 - a. no advertising, LankaApparels will get 70% of the market share;
 - b. medium advertising, LankaApparels can get a market share of 47.5%.

Based on the above available information, with reference to advertising strategy, what should the Strategic Committee of LankaApparels recommend to its Marketing Manager?

05. The Instant Paper Clip Office Supply Company sells and delivers office supplies to companies, schools, and agencies within a 50-kilometre radius from its warehouse. The office supply business is competitive, and the ability to deliver orders promptly is a big factor in getting new customers and maintaining old ones. (Offices typically order not when they run low on stores, but when they completely run out. As a result, they need their orders immediately.) The manager of the company wants to be certain that enough drivers and vehicles are available to deliver orders promptly and that they have adequate inventory in stock. Therefore, the manager wants to be able to forecast the demand for deliveries during the next month. From the records of previous orders, management has accumulated the following data for the past 10 months:

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
Orders	120	90	100	75	110	50	75	130	110	90

- a. Compute the monthly demand forecast for February through November using the naive method.
- b. Compute the monthly demand forecast for April through November using a 3-month moving average.
- c. Compute the monthly demand forecast for June through November using a 5-month moving average.
- d. Compute the monthly demand forecast for April through November using a 3-month weighted moving average. Use weights of 0.5, 0.33, and 0.17, with the heavier weights on more recent months.
- e. Compute the mean absolute deviation for June through October for each of the methods used.
- f. Which method would you use to forecast demand for November?

06. In an inspection department of a garment factory garment quality checkers do the final inspection. The arrival of garments for checking at one of the counters is random and it varies between 1 to 5 minutes. The frequency distribution of arrival time of a garment at that counter is as below.

Time between arrival of garments (minutes)	1	2	3	4	5
Frequency (%)	5	25	35	20	15

The time taken by the quality checker at the counter to check a single garment varies from 1 to 3 minutes, whose frequency distribution is as below.

Checking time for a single garment (minutes)	0	0.5	1.0	1.5	2.0	2.5	3.0
Frequency (%)	5	35	25	15	10	7	3

The quality checker complains that her workload is high, and requests the management to recruit additional quality checkers to her counter. Determine whether the management should accept the request of the quality checker and appoint additional persons to her counter.