



THE OPEN UNIVERSITY OF SRI LANKA

DEPARTMENT OF TEXTILE AND APPAREL TECHNOLOGY

MASTER OF TECHNOLOGY - APPAREL PRODUCTION AND MANGEMENT

FINAL EXAMINATION - 2015/2016

TTX7151- OPERATIONS RESEARCH

DURATION -03 HOURS

OPEN BOOK TEST

DATE: 03rd DECEMBER 2016

TIME: 0930-1230 HOURS

This question paper comprises 06 questions.

You are required to answer a total of 05 questions.

All questions carry equal marks.

1. Table 1 shows node, activity, duration and predecessors for a project.

Node	Activity	Duration	Predecessors
5	B	5	-
10	M	4	B
15	N	9	B
20	Q	15	B
25	A	1	M,N
30	F	4	N,Q
35	X	9	Q
40	C	9	Q
45	Y	9	A,F,X
50	S	6	F
55	J	5	X,F
60	T	10	C
65	V	5	Y,S
70	U	10	V,T,J

Table 1

- a. Construct a precedence diagram for the project. (08 marks)
- b. On the diagram, compute the followings: (08 marks)
- Earliest start time
 - Latest completion time
 - Latest start time
 - Earliest completion time
- c. Based on your computations, identify the critical path for the project. (04 marks)

2. A manufacturer produces three types of plastic fixtures. The time required for moulding, trimming, and packaging for a dozen (12) fixtures is given in Table 2.

Process	Type A (in minutes)	Type B (in minutes)	Type C (in minutes)	Total time available (in hours)
Moulding	60	120	90	12,000
Trimming	40	40	60	4,600
Packaging	30	20	30	2,400
Profit (in LKR)	11.00	16.00	15.00	—

Table 2

How many dozens of each type of fixture should be produced to obtain a maximum profit? (20 marks)

3. a. A manufacturing company, Smart Lanka Limited, requires 6,000 units of a certain item per year for manufacturing a particular product. The ordering cost is LKR 300 per order and the carrying cost per order per unit per year is LKR 40. Find the Economic Order Quantity, the number of orders per year and the time between successive orders. (08 marks)
- b. The company manufactures another product for which demand of a particular component is 8,000 units per year. The carrying cost is LKR 600 per unit per year,

the ordering cost is LKR 1,500 per order and the shortage cost is LKR 2,000 per unit per year. Find the following

- i. Economic Order Quantity
- ii. Maximum inventory
- iii. Maximum shortage quantity
- iv. Cycle time
- v. Inventory period
- vi. Shortage period

(12 marks)

4. a. An apparel company is considering a final "GO" decision on a new product. If the product is introduced and it is successful, the profit is LKR 500,000 and if it is unsuccessful the loss is LKR 300,000. There is no profit or loss if the product is not introduced. The management believes that there is a 0.20 probability (the odds are 2 to 8) that the product will be successful. Based on the above information and under a variety of other criteria (like maxmin, minmax etc), should the firm introduce the product? Steps, which you have considered in taking the above decision, should be given clearly. (10 marks)

b. A consulting company specializing in new product introduction has offered its services to the apparel company. Its betting average in similar situations is as follows.

(i) When advice was given (either by client firm or by others in the market place) on products that later proved to be successful, then company gave "GO" advice eight times out of ten.

(ii) When advice was given (either by client firm or by others in the market place) on products that later proved to be unsuccessful, then company gave "STOP" advice fifteen times out of twenty.

The consulting company charges LKR 5,000 as consulting fee to give advice. Should the company be hired in order to maximize the expected profit? Steps, which you have considered in taking the above decision, should be given clearly.

(10 marks)

5. You are the supply chain manager for an apparel-manufacturing company. Following data given in Table 3 pertaining to a particular product of the company is available with you.

Quarter	Forecast	Actual Demand
4Q-2014	400	420
1Q-2015	420	415
2Q-2015	415	410
3Q-2015	410	420
4Q-2015	420	425
1Q-2016	425	440
2Q-2016	440	455
3Q-2016	460	
4Q-2016	470	
1Q-2017		

Table 3

- Using the data provided in the above table, explain what forecasting techniques have been used for 2014 and the first two quarters of 2015.
- Using the **three quarters moving average**, find out the forecasts for 3Q 2016, 4Q 2016, and 1Q 2017.
- Compute the forecasts for 3Q 2014, 4Q 2014, and 1Q 2015 using **exponential smoothing** with a smoothing factor of 0.6.
- Compute the forecasts for all quarters of 2016 using the **three quarter weighted moving average**, with the most recent data weighted at 0.5, the

second-most recent data weighted at 0.35, and the third-most recent data weighted at 0.15.

- e. Compute the forecasting error using the **exponential smoothing technique**.
- f. Compute the forecasting error using the weighted smoothing average method.
- g. On the basis of your calculations, explain which technique provides the most accurate forecast for your company. Explain your answer with critical reasoning.

(20 marks)

6. In the final inspection room of an apparel factory, one of the inspectors checks the garments and grades them and packs them in bags. The arrival of a bundle of garment for checking by the inspector is a random phenomenon and the time between the arrivals varies between one minute to five minutes and the corresponding frequency distribution is given in Table 4

Time between arrival (minutes)	1	2	3	4	5
Frequency	8	12	20	25	35

Table 4

The time taken by the quality inspector to check a bundle of garments varies from one minute to three minutes and the frequency distribution for it is given in Table 5.

Time taken for checking (minutes)	1.0	1.5	2.0	2.5	3.0
Frequency	5	15	25	35	20

Table 5

The Quality Control Manager of the factory feels that the checking inspector is not sufficiently loaded with work and wants to assign some additional work. However, before taking the decision he likes to know precisely by what percentage of time the checking inspector is idle. Using the Monte Carlo method of simulation solve the problem of the Quality Control Manager. [You may use the random numbers given in Table 6 to solve this problem]

(20 marks)

TABLE 6 - RANDOM DIGITS

96195	07059	13266	31389	87612	88004	31843	83469	22793	14312
22408	94958	19095	58035	43831	32354	83946	57964	70404	32017
53896	23508	16227	56929	74329	12264	26047	66844	47383	42202
22565	02475	00258	79018	70090	37914	27755	00872	71553	56684
49438	20772	60846	69732	07612	70474	46483	21053	95475	53448
65620	34684	00210	04863	01373	19978	61682	69315	46766	83768
20246	26941	41298	04763	19769	25865	95937	03545	93561	73871
09433	09167	35166	32731	73299	41137	37328	28301	61629	05040
95552	73456	16578	88140	80059	50296	07656	01396	83099	09718
76053	05150	69125	69442	16509	03495	26427	58780	27576	31342
34822	35843	78468	82380	52313	71070	71273	10768	86101	51474
07753	04073	58520	80022	28185	16432	86909	82347	10548	83929
04204	94434	62798	81902	29977	57258	87826	35003	46449	76636
96770	19440	29700	42093	64369	69176	29732	37389	34054	28680
65989	62843	10917	34458	81936	84775	39415	10622	36102	16753
06644	94784	66995	61812	54215	01336	75887	57685	66114	76984
88950	46077	34651	12038	87914	20785	39705	73898	12318	78334
21482	95422	02002	33671	46764	50527	46276	77570	68457	62199
55137	61039	02006	69913	11291	87215	89991	26003	55271	08153
98441	81529	59607	65225	49051	28328	85535	37003	87211	10204
57168	30458	23892	07825	53447	53511	09315	42552	43135	57892
71886	65334	38013	09379	83976	42441	14086	33197	82671	05037
40418	59504	52383	07232	14179	59693	37668	26689	93865	78925
28833	76661	47277	92935	63193	94862	60560	72484	29755	40894
37883	62124	62199	49542	55083	20575	44636	92282	52105	77664
44882	33592	66234	13821	86342	00135	87938	57995	34157	99858
19082	13873	07184	21566	95320	28968	31911	06288	77271	76171
45316	29283	89318	55806	89338	79231	91545	55477	19552	03471
22788	55433	31188	74882	44858	69655	08096	70982	61300	23792
08293	86193	05026	21255	63082	92946	28748	25423	45282	57821
29223	70541	67115	84584	10100	33854	26466	77796	70698	99393
22681	80110	31595	09246	39147	11158	43298	36220	88841	11271
74580	90354	43744	22178	38084	60027	24201	71686	59767	33274
69093	71364	08107	96952	50005	30297	97417	89575	04676	35616
40456	91234	58090	65342	95002	28447	21700	43137	13746	85959
72927	67349	83962	58912	59734	76323	02913	46306	53956	38936
61869	33093	81129	06481	89281	83629	81960	63704	56329	10357
40048	16520	07638	10797	22270	57350	72214	36410	95526	87614
68773	97669	28656	89938	12917	25630	08068	19445	76250	24727
09774	30751	49740	11385	91468	28900	76804	52460	52320	70493
46139	36689	82587	13586	35061	76128	38568	62300	43439	53434
26566	95323	32993	89988	12152	01862	93113	33875	31730	62941
06765	57141	48617	18282	13086	76064	83334	70192	15972	80429
35384	90380	12317	89702	33091	68835	62960	38010	52710	87604
49333	78482	36199	11355	86044	88760	03724	22927	91716	92332
45595	14044	56806	99126	85584	87750	78149	22723	48245	78126
79819	15054	76174	12206	06886	06814	43285	20008	75345	19779
11971	62234	74857	46401	20817	57591	41189	49604	29604	30660
11452	89318	53084	21993	62471	74101	61217	76536	58393	63718
38746	81271	96260	98137	60275	22647	33103	50090	29395	10016