PAST PAPERS

Faculty	Department / Section/Division
Not Applicable	Learning Resource Centre

Past Papers

Faculty of Management & social Sciences
Department of Management and Business Studies

BSc (Hons) in Industrial and Business Mathematics

End Semester Examination

(Year 2 – Semester II)

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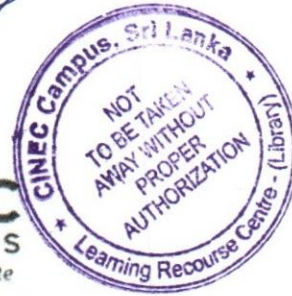# End Semester Examination

Year 2 semester 2

CINEC
C A M P U S
Beyond A Graduate

Faculty of Management and Social Sciences
Department of Management and Business Studies
BSc (Hons) in Business and Industrial Mathematics
Course CODE: COM562

Year 2 Semester II
REPEAT EXAMINATION
Inventory and Warehouse Management – BBIM 2309

- This paper consists of EIGHT questions on NINE (09) pages.
- Answer <u>FIVE (05)</u> questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Equation sheet, Normal distribution service levels and unit loss function table and Standard normal probability table have been attached with the paper.

Date: 2022.08.18   Pass mark: 40%   Time: 03 Hours

Question 01: (Compulsory)

SELECT MOST APPROPRIATE ANSWER OUT OF THE GIVEN CHOICES.

1. Select the correct explanation about Global Trends

    (a) Currently global trend in competition in between supply chains

    (b) Cost is the main global trend of competition

    (c) Flexibility is a traditional global trend in competition

    (d) None of above

2. Inventory Control can be used;

    (a) To avoid only overstocking of items

    (b) To achieve satisfactory levels of customer service while keeping inventory costs within reasonable bounds

    (c) To achieve maximum levels of customer service while keeping inventory costs within reasonable bounds

    (d) To avoid only understocking of items

3. Considers the distribution and handling patterns of items from stores

   (a) SOS

   (b) SDE

   (c) FSN

   (d) ABC

4. Reorder point is

   (a) the quantity on hand when items to be reordered

   (b) the quantity on hand when items dropped

   (c) the odder quantity when items to be reordered

   (d) the order quantity when items dropped

5. Why organizations need to hold inventory?

   (a) Physically difficult and economically impractical for each item to arrive to where it is needed at the exact time of need

   (b) Physically impossible and economically impractical for each item to arrive to where it is needed at the exact time of need

   (c) Physically impossible and costly very high for each item to arrive to where it is needed at the exact time of need

   (d) Systematically impossible and economically impractical for each item to arrive to where it is needed at the exact time of need

6. Objective of Inventory Control

   (a) Achieve satisfactory levels of customer service while keeping inventory costs within least level

   (b) Achieve maximum levels of customer service while keeping inventory costs within reasonable bounds

   (c) Achieve best levels of customer service while keeping inventory costs within reasonable bounds

(d)   Achieve satisfactory levels of customer service while keeping inventory costs within reasonable bounds

7. Extra inventory carried to serve as insurance against fluctuations in demand is called:

(a)   EOQ

(b)   Wastage Inventory

(c)   Safety Stock

(d)   Ordering Point

8. Means of "V", "E" and "D" in VED classification

(a) Vital, Essential, and Desirable

(b) Very important, Essential, and Desirable

(c) Vital, Expected, and Desirable

(d) Vital, Essential, and Design

9. Inventory Turn Over Means

(a) Ratio of average cost of goods sold to average inventory investment

(b) Ratio of cost of goods sold to inventory investment

(c) Ratio of optimum cost of goods sold to optimum inventory investment

(d) Ratio of maximum cost of goods sold to maximum inventory investment

10. Three inventory counting systems;

(a) Time Based System, Perpetual Inventory System, Two-bin System

(b) Periodic System, Perpetual Inventory System, Two-bin System

(c) Periodic System, Time Based Inventory System, Two-bin System

(d) Periodic System, Perpetual Inventory System, Time Based System

11. In what form does warehouses store products in the facilities?

    (a) Raw Material

    (b) Work in Progresses/ Semi finished products

    (c) Finished Products.

    (d) All of the above.

12. What's NOT a warehouse operating principle?

    (a) Stock location

    (b) Physical control and security

    (c) Single story facility

    (d) Order picking and assembly.

13. What are the two major categories that warehouses can be classified into?

    (a) Public and private.

    (b) Contract and multi-client.

    (c) Ownership and Operations

    (d) Consolidation and break-bulk.

14. What's NOT an objective of a warehouse?

    (a) Providing a timely customer service.

    (b) Providing communication links.

    (c) To keep track of items.

    (d) To share the storage space.

15. How does warehousing allows firms to use customer service as a value adding competitive tool?

    (a) Through storing.

    (b) Through short haul transportation.

(c) Through time and place utility.

(d) Through providing communicational links.

16. What's a cost based benefit of warehousing.

    (a) Postponement.

    (b) Spot stocking.

    (c) Full line stocking.

    (d) Production support.

17. What's the material handling equipment which is utilized for both horizontal and vertical movements?

    (a) Tow tractor.

    (b) Power Pallet truck.

    (c) Pallet stacker.

    (d) Hand pallet truck

18. Not a difference between contract and Public warehouses.

    (a) Difference in contract.

    (b) Difference in space availability.

    (c) Difference in space availability.

    (d) Difference in ownership.

19. What's the type of warehouse which comes under operations?

    (a) Fulfillment centers.

    (b) Public warehouses.

    (c) Private warehouses.

    (d) Multi client warehouses.

20. What's not a basic function of a warehouse?

   (a) Transport Consolidation.

   (b) Product mixing.

   (c) Docking

   (d) Break bulk

(01 Mark*20 = 20 Marks)

Question 02

   (a) The maintenance department of a small logistics company uses about 946 cases of liquid cleanser annually. Ordering costs are Rs. 13, carrying costs are Rs. 6 per case a year, and the new price schedule indicates that orders of less than 100 cases will cost Rs. 25 per case, 101 to 150 cases will cost Rs. 20 per case, 151 to 200 cases will cost Rs. 18 per case, and larger orders will cost Rs. 15 per case. Determine the optimal order quantity and the total cost. (06 Marks)

   (b) Pidding manufacturing assembles security monitors. It purchases 3600 black and white cathode ray tubes a year at $65 each. Ordering costs are $31,and annual carrying costs are 20 percent of the purchase price. Compute the optimal quantity and the total annual cost of ordering and carrying the inventory. (07 Marks)

   (c) Surge Electric uses 4,000 toggle switches a year. Switches are priced as follows: 1 to 499, 90 cents each; 500 to 999, 85 cents each; and 1,000 or more, 80 cents each. It costs approximately $30 to prepare an order and receive it, and carrying costs are 40 percent of purchase price per unit on an annual basis. Determine the optimal order quantity and the total annual cost. (07 Marks)

Question 03

   (a) A bag manufacturer uses 48000 zippers per year for its popular hand bag series.The firm makes its own zippers, which it can produce at a rate of 800 per

day. The bags are made uniformly over the entire year. Carrying cost is $1 per zipper a year. Setup cost for a production run of zippers is $45. The firm operates 240 days peryear. Determine the

    a. Optimal run size   (02 Mark)

    b. Minimum total annual cost for carrying and setup   (02 Mark)

    c. Cycle for the optimal runsize   (03 Marks)

    d. Runtime   (03 Mark)

(b) A drugstore uses fixed-order cycles for many of the items it stocks. The manager wants a service level of .98. The order interval is 14 days, and lead time is 2 days. Average demand for one item is 40 units per day, and the standard deviation of demand is 3 units per day. Given the on-hand inventory at the reorder time for each order cycle shown in the following table, determine the order quantities for cycles 2, 3, and 4:   (10 Marks)

Table 3.1 – On hand Quantities

Cycle	On Hand
1	42
2	8
3	103

Question 04

(a) A restaurant uses an average of 50 jars of a special source each week. Weekly usage of sauce has a standard deviation of 3 jars. The manager is willing to accept no more than a 10% risk of stockout during lead time, which is two weeks. Assume the distribution of usage is normal.

(i) Which of the ROP formula is appropriate for this situation? Why?   (03 Marks)

(ii) Determine the value of z.   (03 Marks)

(iii) Determine the ROP.   (04 Marks)

(b) The housekeeping department of a motel uses approximately 600 bars of soap each day, and this tends to be fairly constant. Lead time for soap delivery is normally distributed with a mean of 6 days and a standard deviation of two days. A service level 90% is desired.

(i) Find the ROP. (05 Marks)

(ii) How many days of supply are on hand at the ROP? (05 Marks)

Question 05

One unit of A is made of two units of B and one unit of C. B is made of three units of D and one unit of F. C is composed of three units of B, one unit of D, and four units of E. D is made of one unit of E. Item C has a lead time of one week; Items A, B, E, and F have two-week lead times; and Item D has a lead time of three weeks.

Lot-far-lot lot sizing is used for Items C, E, and F; lots of size 20, 40, and 160 are used for items A, B, and D, respectively. Items A, B, D, and E have on-hand (beginning) inventories of 5, 10, 100, and 100, respectively; all other items have zero beginning inventories. We are scheduled to receive 10 units of A in Week 3, 20 units of B in Week 7, 40 units of F in week 5 and 60 units of E in Week 2; there are no other schedule receipts. If 20 units of A are required in Week 10, use the low-level-coded bill of materials (product structure tree) to find the necessary planned order releases for all components. (20 Marks)

Question 06

(a) Benefits of strategic warehousing can be categorized into two major groups as cost based and service based. Explain in detail, the service based benefits of warehousing. (10 marks)

(b) What are the strategies that are used in the modern day warehouses to improve the cube utilization and accessibility in the available space? (05 marks)

(c) Describe two basic functions of a warehouse. (05 marks)

Question 07

(a) There're several factors which are considered when designing a warehouse. However product flow is a crucial designing criteria to be considered when designing a warehouse. Elaborate why in your own words. (06 Marks)

(b) Most often warehouse design principles suggest that warehouses should be built as one story facilities. Explain why building single story facilities are not practical in the modern warehouses. (08 Marks)

(c) Briefly describe the major types of packaging. (06 Marks)

Question 08

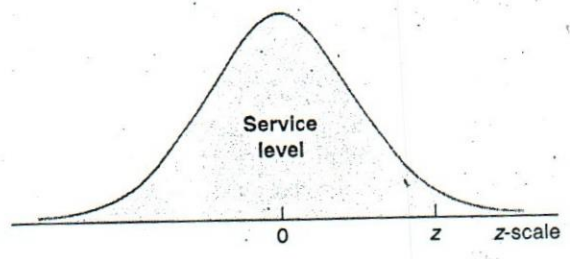Write short notes on below topics (04*05 Marks)

(a) Fulfillment centers.

(b) Public Warehousing.

(c) Role of packaging.

(d) Transport Consolidation.

-------------END OF THE PAPER-------------

Model	Formula		Symbols
1. Basic EOQ	$Q_0 = \sqrt{\dfrac{2DS}{H}}$	(12–2)	Q_0 = Economic order quantity
	$TC = \dfrac{Q}{2}H + \dfrac{D}{Q}S$	(12–1)	D = Annual demand S = Order cost H = Annual carrying cost per unit
	Length of order cycle $= \dfrac{Q}{D}$	(12–3)	Q = Order quantity
2. Economic production quantity	$Q_0 = \sqrt{\dfrac{2DS}{H}}\sqrt{\dfrac{p}{p-u}}$	(12–5)	Q_0 = Optimal run or order size p = Production or delivery rate
	$TC = \dfrac{I_{max}}{2}H + \dfrac{D}{Q}S$	(12–4)	u = Usage rate I_{MAX} = Maximum inventory level
	Cycle time $= \dfrac{Q}{u}$	(12–6)	
	Run time $= \dfrac{Q}{p}$	(12–7)	
	$I_{max} = \dfrac{Q_0}{p}(p-u)$	(12–8)	
3. Quantity discounts	$TC = \dfrac{Q}{2}H + \dfrac{D}{Q}S + PD$	(12–9)	P = Unit price
4. Reorder point under: a. Constant demand and lead time b. Variable demand rate c. Variable lead time d. Variable lead time and demand	$ROP = d(LT)$ $ROP = \bar{d}LT + z(\sigma_d)\sqrt{LT}$ $ROP = d\overline{LT} + z(\sigma_{LT})d$ $ROP = \bar{d}\,\overline{LT} + z\sqrt{\overline{LT}\sigma_d^2 + \bar{d}^2\sigma_{LT}^2}$	(12–10) (12–13) (12–14) (12–15)	ROP = Quantity on hand at reorder point d = Demand rate LT = Lead time $\bar{d}$ = Average demand rate σ_d = Standard deviation of demand rate z = Standard normal deviation $\overline{LT}$ = Average lead time σ_{LT} = Standard deviation of lead time
5. ROP shortages a. Units short per cycle b. Units short per year c. Annual service level	$E(n) = E(z)\sigma_{dLT}$ $E(N) = E(n)\dfrac{D}{Q}$ $SL_{annual} = 1 - \dfrac{E(z)\sigma_{dLT}}{Q}$	(12–16) (12–17) (12–19)	$E(n)$ = Expected number short per cycle $E(z)$ = Standardized number short σ_{dLT} = Standard deviation of lead time demand $E(N)$ = Expected number short per year SL_{annual} = Annual service level
6. Fixed interval	$Q = \bar{d}(OI + LT)$ $\quad + z\sigma_d\sqrt{OI + LT} - A$	(12–20)	OI = Time between orders A = Amount on hand at order time
7. Single period	$SL = \dfrac{C_s}{C_s + C_e}$	(12–21)	SL = Service level C_s = Shortage cost per unit C_e = Excess cost per unit

TABLE 12.3 Normal distribution service levels and unit normal loss function

z	Lead Time Service Level	E(z)	z	Lead Time Service Level	E(z)	z	Lead Time Service Level	E(z)	z	Lead Time Service Level	E(z)
-2.40	.0082	2.403	-.80	.2119	.920	0.80	.7881	.120	2.40	.9918	.0030
-2.36	.0091	2.363	-.76	.2236	.889	0.84	.7995	.112	2.44	.9927	.0020
-2.32	.0102	2.323	-.72	.2358	.858	0.88	.8106	.104	2.48	.9934	.0020
-2.28	.0113	2.284	-.68	.2483	.828	0.92	.8212	.097	2.52	.9941	.0020
-2.24	.0125	2.244	-.64	.2611	.798	0.96	.8315	.089	2.56	.9948	.0020
-2.20	.0139	2.205	-.60	.2743	.769	1.00	.8413	.083	2.60	.9953	.0010
-2.16	.0154	2.165	-.56	.2877	.740	1.04	.8508	.077	2.64	.9959	.0010
-2.12	.0170	2.126	-.52	.3015	.712	1.08	.8599	.071	2.68	.9963	.0010
-2.08	.0188	2.087	-.48	.3156	.684	1.12	.8686	.066	2.72	.9967	.0010
-2.04	.0207	2.048	-.44	.3300	.657	1.16	.8770	.061	2.76	.9971	.0010
-2.00	.0228	2.008	-.40	.3446	.630	1.20	.8849	.056	2.80	.9974	.0008
-1.96	.0250	1.969	-.36	.3594	.597	1.24	.8925	.052	2.84	.9977	.0007
-1.92	.0274	1.930	-.32	.3745	.576	1.28	.8997	.048	2.88	.9980	.0006
-1.88	.0301	1.892	-.28	.3897	.555	1.32	.9066	.044	2.92	.9982	.0005
-1.84	.0329	1.853	-.24	.4052	.530	1.36	.9131	.040	2.96	.9985	.0004
-1.80	.0359	1.814	-.20	.4207	.507	1.40	.9192	.037	3.00	.9987	.0004
-1.76	.0392	1.776	-.16	.4364	.484	1.44	.9251	.034	3.04	.9988	.0003
-1.72	.0427	1.737	-.12	.4522	.462	1.48	.9306	.031	3.08	.9990	.0003
-1.68	.0465	1.699	-.08	.4681	.440	1.52	.9357	.028	3.12	.9991	.0002
-1.64	.0505	1.661	-.04	.4840	.419	1.56	.9406	.026	3.16	.9992	.0002
-1.60	.0548	1.623	.00	.5000	.399	1.60	.9452	.023	3.20	.9993	.0002
-1.56	.0594	1.586	.04	.5160	.379	1.64	.9495	.021	3.24	.9994	.0001
-1.52	.0643	1.548	.08	.5319	.360	1.68	.9535	.019	3.28	.9995	.0001
-1.48	.0694	1.511	.12	.5478	.342	1.72	.9573	.017	3.32	.9995	.0001
-1.44	.0749	1.474	.16	.5636	.324	1.76	.9608	.016	3.36	.9996	.0001
-1.40	.0808	1.437	.20	.5793	.307	1.80	.9641	.014	3.40	.9997	.0001
-1.36	.0869	1.400	.24	.5948	.290	1.84	.9671	.013			
-1.32	.0934	1.364	.28	.6103	.275	1.88	.9699	.012			
-1.28	.1003	1.328	.32	.6255	.256	1.92	.9726	.010			
-1.24	.1075	1.292	.36	.6406	.237	1.96	.9750	.009			
-1.20	.1151	1.256	.40	.6554	.230	2.00	.9772	.008			
-1.16	.1230	1.221	.44	.6700	.217	2.04	.9793	.008			
-1.12	.1314	1.186	.48	.6844	.204	2.08	.9812	.007			
-1.08	.1401	1.151	.52	.6985	.192	2.12	.9830	.006			
-1.04	.1492	1.117	.56	.7123	.180	2.16	.9846	.005			
-1.00	.1587	1.083	.60	.7257	.169	2.20	.9861	.005			
-.96	.1685	1.049	.64	.7389	.158	2.24	.9875	.004			
-.92	.1788	1.017	.68	.7517	.148	2.28	.9887	.004			
-.88	.1894	0.984	.72	.7642	.138	2.32	.9898	.003			
-.84	.2005	0.952	.76	.7764	.129	2.36	.9909	.003			

Service level

0   z   z-scale

Standard Normal Probabilities

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Standard Normal Probabilities
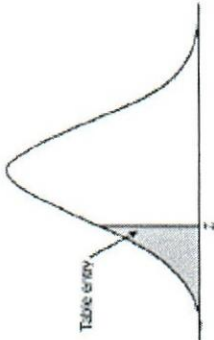
Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
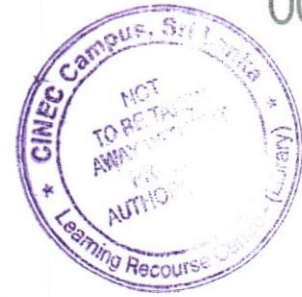
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BSc Hons in Business and Industrial Mathematics
Course CODE: BSc 562

Year 2 Semester II
SEMESTER END EXAMINATION
Graph Theory and Its Application BBIM 2306

- This paper consists of EIGHT (08) questions on SEVEN (07) pages.
- Answer <u>FIVE (05)</u> questions including question 01.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2022.03.10   Pass mark: 40%   Time: 03 Hours

Question 01 (Compulsory)

(a) Check the following Graph is Hamiltonian graph or Not? Justify your answer.
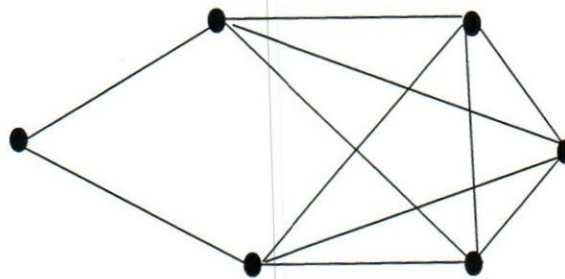
(06 Marks)

(b) Suppose a simple graph has 16 edges, 3 vertices of degree 4, and all
    Others of degree 2.   How many vertices does the graph has?

(06 Marks)

(c) What is a bridge of the Graph? Identify the bridges in the following graph.
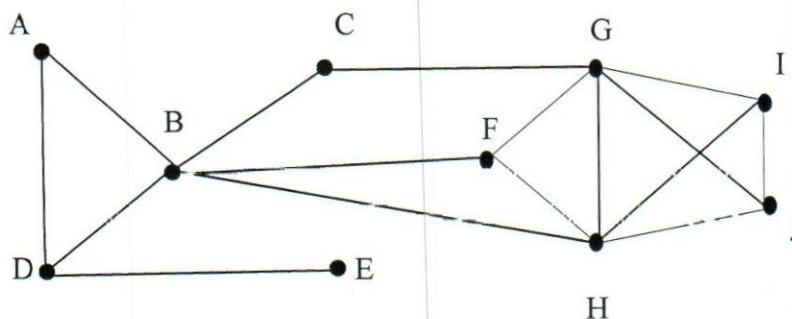
(07 Marks)

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(d) Draw the following graphs and check the planarity.

       (i) K_5 (ii) $K_{2,6}$

                                                   (06 Marks)

(e) Find three spanning tree and Minimum Spanning Tree of the below Graph
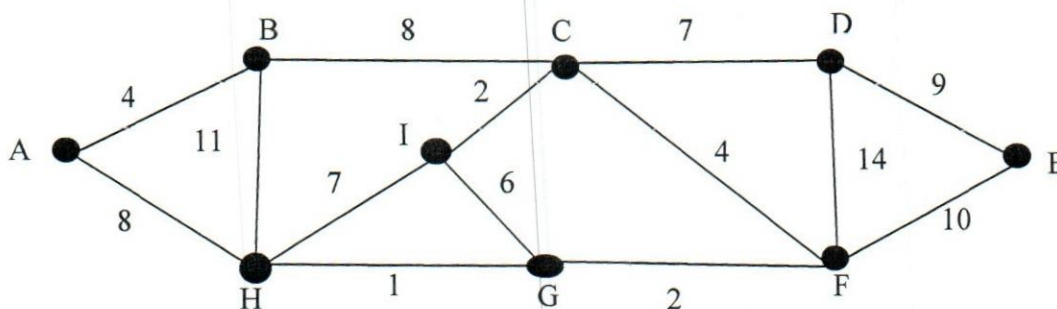
                                                   (06 Marks)

(f) Describe the Handshaking Lemma.   (03 Marks)

(g) What is the chromatic number of the below graph.
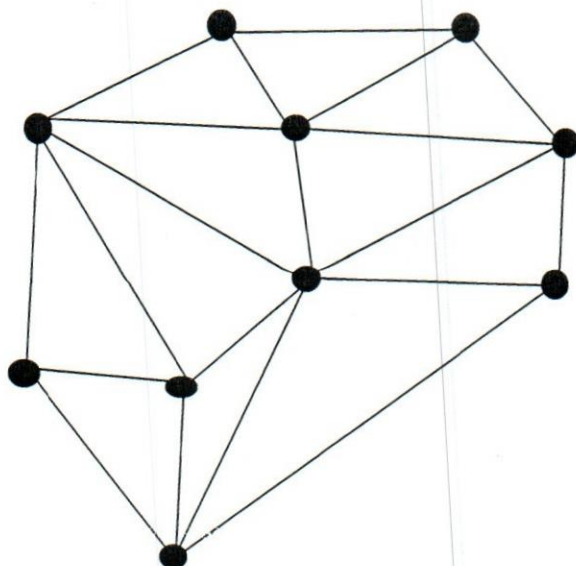
                                                   (06 Marks)

Question 02

(a) Define All vertices and Edges of the Graph. (03 Marks)
(b) Construct the Incident and Adjacent Matrices of the above Graph. (08 Marks)
(c) Is this Graph Simple or Not?. Justify Your Answer. (04 Marks)

Question 03

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(a)   Define the vertices and Edges set of the above Graph (05 Marks)
(b)   Is this Graph Hamiltonian Or Not?   (05 Marks)
(c)   Is this Graph Eulerian or Not.? Justify Your Answer   (05 Marks)

Question 04

(a) Consider the complete graph with (n-1) vertices. Show that the number of edges of
the Graph is (n-1)(n-2)/2

(05 Marks)

(b)

Consider the above Graph and prove the Handshaking lemma.
(10 Marks)

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Question 05

(a) Define the Subgraph of a Given Graph.

(05 Marks)

(G)

(H)

(b) Consider the above Two Graphs G and H. Is G is Sub Graph of H. Justify Your
Answer

(10 Marks)

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Question 06
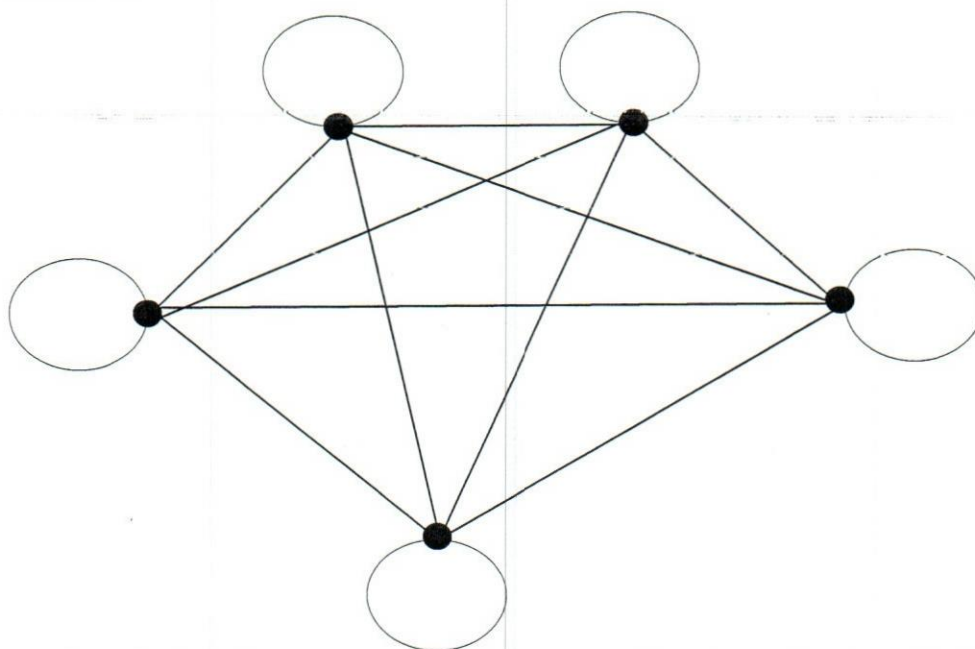
(a)   Define the vertices and Edges sets of the above Graph   (03 Marks)
(b)   Is this Graph Hamiltonian Or Not?   (02 Marks)
(c)   Is this Graph Eulerian or Not.? Justify Your Answer   (04 Marks)
(d)   Find the Degree of the each vertex of the Graph   (03 Marks)
(e)   Use above (d) to prove the Handshaking Lemma   (03 Marks)

Question 07

(a)   Draw the graph whose vertices and edges are as follows. Is this graph simple ? Justify your answer.

$V = \{ u, v, w, x, y \}$ $E = \{ uv, vw, wx, uv, ww, wx, xy \}$

(03 Marks)

(b)   Draw the following graphs and check the planarity.

(i) K_5 (ii) $K_{2,4}$

(06 Marks)

(c)   Find a graph on 10 vertices with each vertex having degree 3, such that there are at least 7, 5-cycles.

(06 Marks)

Question 08

(a) Check the following Graph is Eulerian graph or Not? Justify your answer.

(06 Marks)

(b) Suppose that a tree has two vertices of degree 5. Three vertices of degree 4, six vertices of degree 3, eight vertices of degree 2 and r vertices of degree 1. Find r

(05 Marks)

(c) Is there a exist graph on 18 vertices where two vertices have degree 16 and the other 16 Vertices have degree 2. Justify your answer.   (04 Marks)

------------- END OF THE PAPER -------------
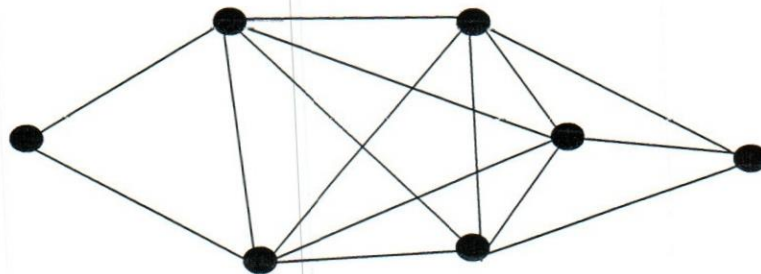
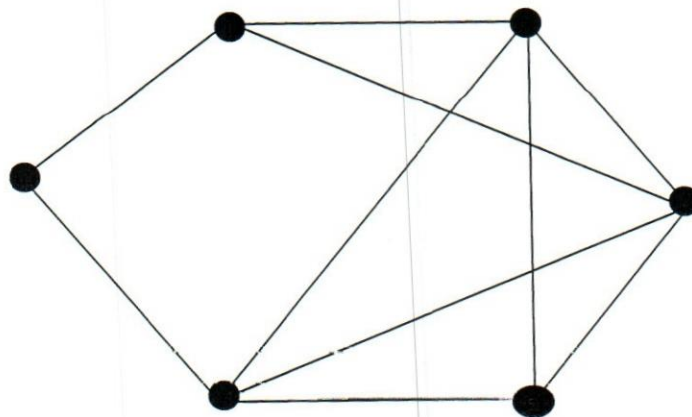**CINEC**
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Course CODE: BSc 562

Year 2 Semester II
SEMESTER END EXAMINATION
Optimization BBIM 2307

- This paper consists of EIGHT (08) questions on EIGHT (08) pages.
- Answer <u>FIVE (05)</u> questions including question 01.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2022.03.12　　　　　　　Pass mark: 40%　　　　　　　Time: 03 Hours

Question 01 (Compulsory)

(a) Write the dual to the following LP problem.

$$Maximize\ Z = x_1 - x_2 + 3x_3$$

subject to

$$x_1 + x_2 + x_3 \leq 10$$
$$2x_1 - x_2 - x_3 \leq 2$$
$$2x_1 - 2x_2 - 3x_3 \leq 6$$
$$x_1, x_2, x_3 \geq 0$$

(05 Marks)

(b) A dairy firm has three plants located in a state. The daily milk production at each plant is as follows:

Plant 1 : 6 million liters　　　Plant 2 : 1 million liters　　　Plant 3 : 10 million liters

Each day, the firm must fulfil the needs of its four distribution centers. The minimum requirement of each center is as follows:

Distribution center 1 : 7 million liters　　　　Distribution center 2 : 5 million liters

Distribution center 3 : 3 million liters　　　　Distribution center 4 : 2 million liters

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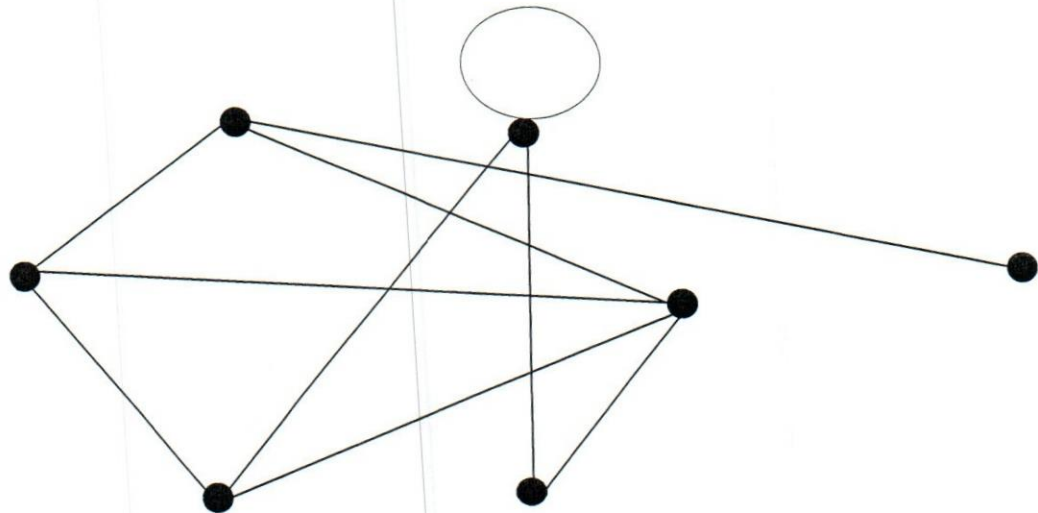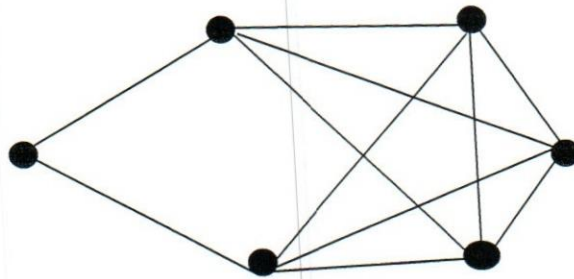BSc Hons in Business and Industrial Mathematics
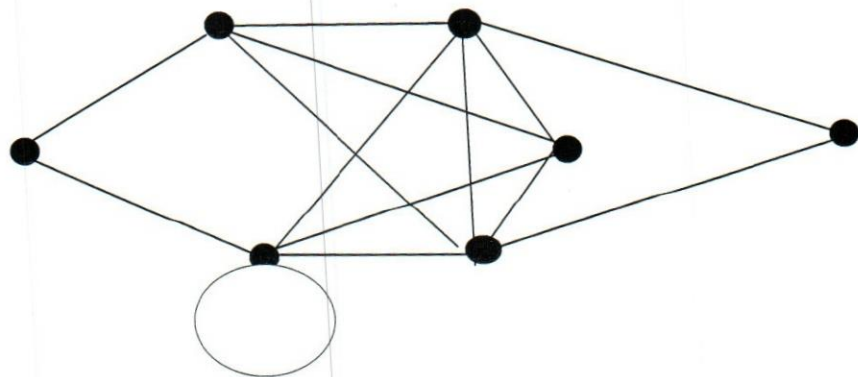Course CODE: BSc 562

Cost (in hundreds of rupees) of shipping one million liter from each plant to each distribution center is given in the following Table 1:

		Distribution Centre		
		D_1	D_2	D_3	D_4
	P_1	2	3	11	7
Plant	P_2	1	0	6	1
	P_3	5	8	15	9

Table 1

Find the initial basic feasible solution for given problem by using <u>North-west corner rule Method</u>. (08 Marks)

(c) Write two real world applications of simulation models. (02 Marks)

(d) Write the given LP problem in standard form.

$$Maximize\ Z = 3x_1 + 5x_2 + 4x_3$$
$$subject\ to$$
$$2x_1 + 3x_2 \le 8$$
$$2x_1 + 5x_2 \le 10$$
$$3x_1 + 2x_2 + 4x_3 \le 15$$
$$x_1, x_2, x_3 \ge 0$$

(05 Marks)

Question 02

(a) Mention and briefly explain 3 types of solutions in a Linear Programming Problem.

(06 Marks)

(b) A company makes two kinds of leather belts; belt A and belt B. Belt A is a high-quality belt and belt B is of lower quality. The respective profits are Rs 4 and Rs 3 per belt. The

production of each of type A requires twice as much time as a belt of type B, and if all belts were of type B, the company could make 1,000 belts per day. The supply of leather is sufficient for only 800 belts per day (both A and B combined). Belt A requires a fancy buckle and only 400 of these are available per day. There are only 700 buckles a day available for belt B. What should be the daily production of each type of belt which gives a maximum profit?

(i) Formulate this problem as an LP model.

(06 Marks)

(ii) Solve the formulated LP model using the simplex method.   (08 Marks)

Question 03

(a) Determine an initial basic feasible solution to the following transportation problem by using Vogel's Approximation Method. (Refer Table 2)

Table 2

Destination

		D_1	D_2	D_3	D_4	Supply
	A	11	13	17	14	250
Source	B	16	18	14	10	300
	C	21	24	13	10	400
Demand		200	225	275	250	

(10 Marks)

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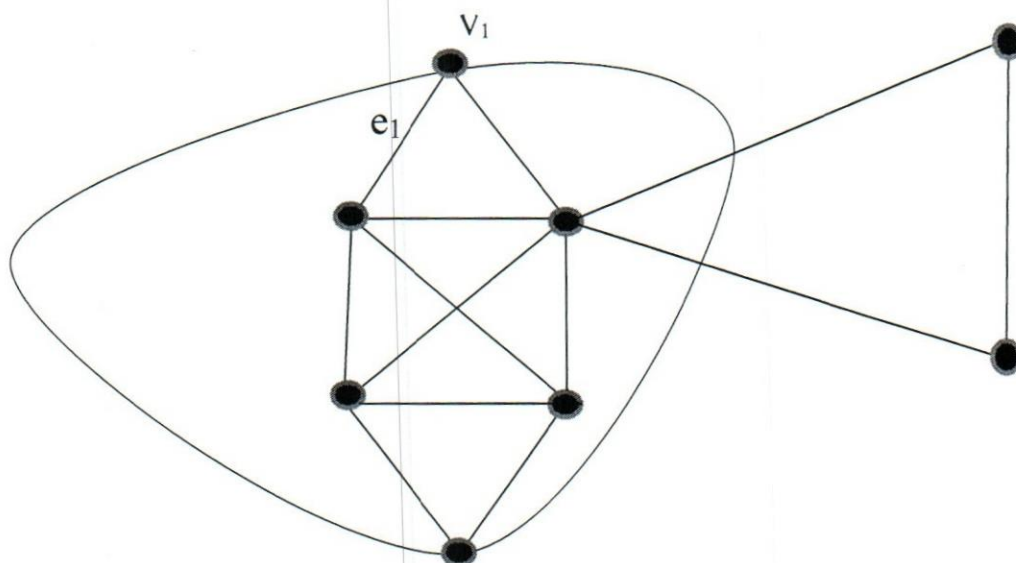**C A M P U S**
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(b) A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His estimates of the times that each man would take to perform each task is given in the matrix below (Figure 1):

		Tasks			
		I	II	III	IV
	A	8	26	17	11
	B	13	28	4	26
Subordinates	C	38	19	18	15
	D	19	26	24	10

Figure 1

How should the tasks be allocated to subordinates to minimize the total man-hours?

(10 Marks)

Question 04

(a) With reference to a <u>transportation problem</u> define the following terms:

(i) Feasible solution   (02 Marks)

(ii) Optimal solution   (02 Marks)

(b) The Table 3 provides all the necessary information on the availability of supply to each warehouse, the requirement of each market, and the unit transportation cost (in Rs) from each warehouse to each market.

Table 3

Market

		P	Q	R	S	Supply
	A	6	3	5	4	22
Warehouse	B	5	9	2	7	15
	C	5	7	8	6	8
	Demand	7	12	17	9	45

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The shipping clerk of the shipping agency has worked out the following schedule, based on his own experience: 12 units from A to Q, 1 unit from A to R, 9 units from A to S, 15 units from B to R, 7 units from C to P and 1 unit from C to R.

(i) Check and see if the clerk has the optimal schedule. (08 Marks)

(ii) Find the optimal schedule and minimum total transport cost. (08 Marks)

Question 05

(a) What is an assignment problem? Give two applications. (04 Marks)

(b) A department of a company has five employees with five jobs to be performed. The time (in hours) that each man takes to perform each job is given in the effectiveness matrix (Figure 2).

Employees

		I	II	III	IV	V
	A	10	5	13	15	16
	B	3	9	18	13	6
Jobs	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

Figure 2

(i) How should the jobs be allocated, one per employee, to minimize the total man-hours?

(12 Marks)

(ii) Hence calculate the minimum total man-hours. (04 Marks)

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Question 06

(a) Use Big-M method to solve the following LP problem.

$$Minimize\ Z = 5x_1 + 3x_2$$

subject to

$$2x_1 + 4x_2 \leq 12$$
$$2x_1 + 2x_2 = 10$$
$$5x_1 + 2x_2 \geq 10$$
$$x_1, x_2 \geq 0$$

(14 Marks)

(b) Use the <u>graphical method</u> to solve the following LP problem.

$$Maximize\ Z = 15x_1 + 10x_2$$

subject to

$$4x_1 + 6x_2 \leq 360$$
$$3x_1 \leq 180$$
$$5x_2 \leq 200$$
$$x_1, x_2 \geq 0$$

(06 Marks)

Question 07

(a) A firm manufactures two products A and B on machines I and II as shown below (Table 4):

Table 4

Machine	Product		Available Hours
	A	B	
I	30	20	300
II	5	10	110
Profit per unit (Rs)	6	8	

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The total time available is 300 hours and 110 hours on machines I and II, respectively. Products A and B contribute a profit of Rs 6 and Rs 8 per unit, respectively.

(i) Construct the primal LP problem and the dual LP problem for the given problem.

(10 Marks)

(ii) Briefly explain <u>one</u> method to determine the dual values using optimal primal solution. (No need to solve the given problem.)   (05 Marks)

(b) A service machine always has a standby unit for immediate replacement upon failure. The time to failure of the machine (or its standby unit) is exponential and occurs every 5 hours, on the average. The machine operator claims that the machine is "in the habit" of breaking down every night around 8:30 p.m. Analyse the operator's claim.

(05 Marks)

Question 08

(a) Consider the given LP problem.

$$Minimize\ Z = x_1 + x_2$$

subject to

$$2x_1 + x_2 \geq 4$$
$$x_1 + 7x_2 \geq 7$$
$$x_1, x_2 \geq 0$$

Construct the <u>Phase 1 initial table</u> to solve this using Two-Phase Method. (Do not solve.)

(08 Marks)

(b) A company has three plants and four warehouses. The supply and demand in units and the corresponding transportation costs are given. The table below (Figure 3) has been taken from the solution procedure of a transportation problem:

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Warehouses

Plants		I		II		III		IV	Supply
A	5		10		4	(10)	5		10
B	6	(20)	8		7		2	(5)	25
C	4	(5)	2	(10)	5	(5)	7		20
Demand		25		10		15		5	55

Figure 3

Answer the following questions, giving brief reasons:

(i) Is this solution feasible?   (02 Marks)

(ii) Is this solution degenerate?   (02 Marks)

(iii) Is this solution optimum?   (04 Marks)

(iv) Does this problem have more than one optimum solution? How did you determine

that?   (04 Marks)

------------ END OF THE PAPER -------------

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Year 2 Semester II
FINAL EXAMINATION
Inventory and Warehouse Management – BBIM 2309

- This paper consists of EIGHT questions on SEVEN (07) pages.
- Answer <u>FIVE (05)</u> questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Equation sheet, Normal distribution service levels and unit loss function table and Standard normal probability table have been attached with the paper.

Date: 2022.03.24   Pass mark: 40%   Time: 03 Hours

Question 01: (Compulsory)

SELECT MOST APPROPRIATE ANSWER OUT OF THE GIVEN CHOICES.

1. Currently global trends in competition based on;

    (a)   Quality, Cost, Organization Vs Organization

    (b)   Quality, Flexibility, Responsiveness

    (c)   Quality, Cost, Supply Chain Vs Supply Chain

    (d)   Quality, Cost, Responsiveness

2. Inventory Control can be used;

    (a)   To avoid only overstocking of items

    (b)   To achieve satisfactory levels of customer service while keeping inventory costs within reasonable bounds

    (c)   To achieve maximum levels of customer service while keeping inventory costs within reasonable bounds

    (d)   To avoid only understocking of items

3. Not an Assumption of an EOQ

    (a)   Only one product is involved

    (b)   Annual demand requirements known

    (c)   Demand is even throughout the year

    (d)   Lead time is not a constant

4. Extra inventory carried to serve as insurance against fluctuations in demand is called:

    (a)   EOQ

    (b)   Wastage Inventory

    (c)   Safety Stock

    (d)   Ordering Point

5. Reorder point is

    (a)   the quantity on hand when items to be reordered

    (b)   the quantity on hand when items dropped

    (c)   the odder quantity when items to be reordered

    (d)   the order quantity when items dropped

6. In what form does warehouses store products in the facilities?

    (a) Raw Material

    (b) Work in Progresses/ Semi finished products

    (c) Finished Products.

    (d) All of the above.

7. What's <u>NOT</u> an objective of a warehouse?

    (a) Providing a timely customer service.

    (b) Providing communication links.

    (c) To keep track of items.

    (d) To share the storage space.

8. What are the two major categories that warehouses can be classified into?

   (a) Public and private.

   (b) Contract and multi-client.

   (c) Ownership and Operations

   (d) Consolidation and break-bulk.

9. What are the two major categories that warehouses can be classified into?

   (a) Public and private.

   (b) Contract and multi-client.

   (c) Ownership and Operations

   (d) Consolidation and break-bulk.

10. What's NOT a warehouse operating principle?

   (a) Stock location

   (b) Physical control and security

   (c) Single story facility

   (d) Order picking and assembly.

   (02 Marks*10 = 20 Marks)

Question 02

(a) A large bakery buys flour in 25-pound bags. The bakery uses an average of 4860 bags a year. Preparing an order and receiving a shipment of flour involves a cost of $10 per order. Annual carrying costs are $75 per bag.

   i. Determine the EOQ. (03 Marks)

   ii. How many orders per year will there be? (02 Marks)

   iii. Compute the total cost of ordering and carrying flour. (03 Marks)

   iv. If ordering costs were to increase by $1 per order, how much would that affect the minimum total annual cost? (03 Marks)

(b) A mail-order house uses 18,000 boxes a year. Carrying costs are 60 cents per box a year, and ordering costs are $96. The following price schedule applies.

Determine

    i.   The optimal order quantity.   (06 Marks)

    ii. The number of orders per year.   (03 Marks)

Number of Boxes	Price per Box ($)
1000-1999	1.25
2000-4999	1.2
5000-9999	1.15
10000 or more	1.1

Question 03

(a) Demand for walnut fudge ice cream at the Sweet Cream Dairy can be approximated by a normal distribution with a mean of 21 gallons per week and a standard deviation of 3.5 gallons per week. The new manager desires a service level of 90 percent. Lead time is two days, and the dairy is open seven days a week. (Hint: Work in terms of weeks.)

    i.   If an ROP model is used, what ROP would be consistent with the desired service level? How many days of supply are on hand at the ROP, assuming average demand?   (05 Marks)

    ii. If a fixed-interval model is used instead of an ROP model, what order size would be needed for the 90 percent service level with an order interval of 10 days and a supply of 8 gallons on hand at the order time? What is the probability of experiencing a stockout before this order arrives?

                                           (05 Marks)

(b) A drugstore uses fixed-order cycles for many of the items it stocks. The manager wants a service level of .98. The order interval is 14 days, and lead time is 2 days. Average demand for one item is 40 units per day, and the standard deviation of demand is 3 units per day. Given the on-hand inventory at the reorder time for

each order cycle shown in the following table, determine the order quantities for cycles 2, 3, and 4: (10 Marks)

Table 3.1 – On hand Quantities

Cycle	On Hand
1	42
2	8
3	103

Question 04

(a) The manager of a store that sells office supplies has decided to set an annual service level of 96% for a certain model of telephone answering equipment. The store sells approximately 300 of this model a year. Holding cost is $5 per unit annually, ordering cost is $25, and standard deviation of lead time demand is 7.

   i.   What average number of units per year will be consistent with the specified annual service level? (03 Marks)

   ii.   What average number of units short per cycle will provide the desired annual service level? (03 Marks)

   iii.   What lead time service level is necessary for the 96% annual service level? (04 Marks)

(b) Famous Albert prides himself on being the cookie kings of the west small, freshly baked cookies are the specialty of his shop. Famous Albert has asked for help to determine the number of cookies he should make each day. From an analysis of past demand he estimates demand for cookies as

Table 4.1: Probability of Demand

Demand (dozen)	Probability of Demand
1, 800	0.05
2, 000	0.10
2, 200	0.20

2, 400	0.30
2, 600	0.20
2, 800	0.10
3, 000	0.05

Each dozen sells for Rs. 69 and costs Rs. 49, which includes handling and transportation. Cookies that are not sold at the end of the day are reduced to Rs. 0.29 and sold the following day as day old merchandize. What is the optimal number of cookies to make? (10 Marks)

Question 05

(a) End item P is composed of three subassemblies: K, L, and W. K is assembled using 3 Gs and 4 Hs; L is made of 2 Ms and 2 Ns; and W is made of 3 Zs. On-hand inventories are 20 Ls, 40 Gs, and 200Hs. Scheduled receipts are 10 Ks at the start of week 3, 30 Ks at the start of week 6, and 200 Ws at the start of week 3.

One hundred Ps will be shipped at the start of week 6, and another 100 at the start of week 7. Load times are two weeks for subassemblies and one week for components G, H, and M. Final assembly of P requires one week. Include an extra 10 percent scrap allowance in each planned order of G. The minimum order size for H is 200 units. Develop each of the following:

   i.   A product structure tree.   (04 Marks)

   ii. A master schedule for P.   (04 Marks)

   iii. Material requirements plan for K, G, and H using lot-for-lot ordering.

                                                                         (12 Marks)

Question 06

   a) Explain the concept "Short haul transportation in warehousing"   (04 Marks)

   b) Imagine that you work as a warehouse manager and explain the warehousing process in detail.   (08 Marks)

c) Even though, warehouse layout design principles suggest that warehouses should possess single story facility, now the trend in most of the Asian countries are to move towards, multi storied warehousing facilities. Discuss in detail, as to why do the Asian countries move towards multi storied warehousing facilities and discuss about its applicability to Sri Lankan context. (08 Marks)

Question 07

a) Explain how modern-day warehouses utilize modern technologies to improve the cube utilization and accessibility. (06 Marks)

b) Elaborate in detail, the basic functions of a warehouse. (06 Marks)

c) There're several factors which are considered when designing a warehouse. However, product flow is a crucial designing criterion to be considered when designing a

warehouse. Elaborate why in your own words. (08 Marks)

Question 08

a) Benefits of strategic warehousing can be categorized into two major groups as cost based and service based. Explain in detail, the cost-based benefits of warehousing. (06 Marks)

b) Explain the role of performed by a package of a product in your own words.

(04 Marks)

c) Elaborate what cross docking is in your own words. (04 Marks)

d) Distinguish between public and contract warehousing using an example.

(06 Marks)

-------------END OF THE PAPER-------------

$$Q_0 = \sqrt{\frac{2DS}{H}} \qquad (12\text{-}2)$$

$$TC = \frac{Q}{2}H + \frac{D}{Q}S \qquad (12\text{-}1)$$

$$\text{Length of order cycle} = \frac{Q}{D} \qquad (12\text{-}3)$$

Q_0 = Economic order quantity
D = Annual demand
S = Order cost
H = Annual carrying cost per unit
Q = Order quantity

00004

$$Q_0 = \sqrt{\frac{2DS}{H}} \sqrt{\frac{p}{p-u}} \qquad (12\text{-}5)$$

$$TC = \frac{I_{max}}{2}H + \frac{D}{Q}S \qquad (12\text{-}4)$$

$$\text{Cycle time} = \frac{Q}{u} \qquad (12\text{-}6)$$

$$\text{Run time} = \frac{Q}{p} \qquad (12\text{-}7)$$

$$I_{max} = \frac{Q_0}{p}(p-u) \qquad (12\text{-}8)$$

Q_0 = Optimal run or order size
p = Production or delivery rate
u = Usage rate
I_{MAX} = Maximum inventory level

$$TC = \frac{Q}{2}H + \frac{D}{Q}S + PD \qquad (12\text{-}9)$$

P = Unit price

$$ROP = d(LT) \qquad (12\text{-}10)$$
$$ROP = \bar{d}\,LT + z(\sigma_d)\sqrt{LT} \qquad (12\text{-}13)$$
$$ROP = d\overline{LT} + z(\sigma_{LT})d \qquad (12\text{-}14)$$
$$ROP = \bar{d}\,\overline{LT} + z\sqrt{LT\sigma_d^2 + d^2\sigma_{LT}^2} \qquad (12\text{-}15)$$

ROP = Quantity on hand at reorder point
d = Demand rate
LT = Lead time
$\bar{d}$ = Average demand rate
σ_d = Standard deviation of demand rate
z = Standard normal deviation
$\overline{LT}$ = Average lead time
σ_{LT} = Standard deviation of lead time

$$E(n) = E(z)\sigma_{dLT} \qquad (12\text{-}16)$$

$$E(N) = E(n)\frac{D}{Q} \qquad (12\text{-}17)$$

$$SL_{annual} = 1 - \frac{E(z)\sigma_{dLT}}{Q} \qquad (12\text{-}19)$$

$E(n)$ = Expected number short per cycle
$E(z)$ = Standardized number short
σ_{dLT} = Standard deviation of lead time demand
$E(N)$ = Expected number short per year
SL_{annual} = Annual service level

$$= \bar{d}(OI + LT) + z\sigma_d\sqrt{OI + LT} - A \qquad (12\text{-}20)$$

OI = Time between orders
A = Amount on hand at order time

$$= \frac{C_s}{C_s + C_e} \qquad (12\text{-}21)$$

SL = Service level
C_s = Shortage cost per unit
C_e = Excess cost per unit

TABLE 12.3 Normal distribution service levels and unit normal loss function

z	Lead Time Service Level	E(z)	z	Lead Time Service Level	E(z)	z	Lead Time Service Level	E(z)	z	Lead Time Service Level	E(z)
-2.40	.0082	2.403	-.80	.2119	.920	0.80	.7881	.120	2.40	.9918	.0030
2.36	.0091	2.363	-.76	.2236	.889	0.84	.7995	.112	2.44	.9927	.0020
-2.32	.0102	2.323	-.72	.2358	.858	0.88	.8106	.104	2.48	.9934	.0020
-2.28	.0113	2.284	-.68	.2483	.828	0.92	.8212	.097	2.52	.9941	.0020
-2.24	.0125	2.244	-.64	.2611	.798	0.96	.8315	.089	2.56	.9948	.0020
-2.20	.0139	2.205	-.60	.2743	.769	1.00	.8413	.083	2.60	.9953	.0010
-2.16	.0154	2.165	-.56	.2877	.740	1.04	.8508	.077	2.64	.9959	.0010
-2.12	.0170	2.126	-.52	.3015	.712	1.08	.8599	.071	2.68	.9963	.0010
-2.08	.0188	2.087	-.48	.3156	.684	1.12	.8686	.066	2.72	.9967	.0010
-2.04	.0207	2.048	-.44	.3300	.657	1.16	.8770	.061	2.76	.9971	.0010
-2.00	.0228	2.008	-.40	.3446	.630	1.20	.8849	.056	2.80	.9974	.0008
-1.96	.0250	1.969	-.36	.3594	.597	1.24	.8925	.052	2.84	.9977	.0007
-1.92	.0274	1.930	-.32	.3745	.576	1.28	.8997	.048	2.88	.9980	.0006
-1.88	.0301	1.892	-.28	.3897	.555	1.32	.9066	.044	2.92	.9982	.0005
-1.84	.0329	1.853	-.24	.4052	.530	1.36	.9131	.040	2.96	.9985	.0004
-1.80	.0359	1.814	-.20	.4207	.507	1.40	.9192	.037	3.00	.9987	.0004
-1.76	.0392	1.776	-.16	.4364	.484	1.44	.9251	.034	3.04	.9988	.0003
-1.72	.0427	1.737	-.12	.4522	.462	1.48	.9306	.031	3.08	.9990	.0003
-1.68	.0465	1.699	-.08	.4681	.440	1.52	.9357	.028	3.12	.9991	.0002
-1.64	.0505	1.661	-.04	.4840	.419	1.56	.9406	.026	3.16	.9992	.0002
-1.60	.0548	1.623	.00	.5000	.399	1.60	.9452	.023	3.20	.9993	.0002
-1.56	.0594	1.586	.04	.5160	.379	1.64	.9495	.021	3.24	.9994	.0001
-1.52	.0643	1.548	.08	.5319	.360	1.68	.9535	.019	3.28	.9995	.0001
-1.48	.0694	1.511	.12	.5478	.342	1.72	.9573	.017	3.32	.9995	.0001
-1.44	.0749	1.474	.16	.5636	.324	1.76	.9608	.016	3.36	.9996	.0001
-1.40	.0808	1.437	.20	.5793	.307	1.80	.9641	.014	3.40	.9997	.0001
-1.36	.0869	1.400	.24	.5948	.290	1.84	.9671	.013			
-1.32	.0934	1.364	.28	.6103	.275	1.88	.9699	.012			
-1.28	.1003	1.328	.32	.6255	.256	1.92	.9726	.010			
-1.24	.1075	1.292	.36	.6406	.237	1.96	.9750	.009			
-1.20	.1151	1.256	.40	.6554	.230	2.00	.9772	.008			
-1.16	.1230	1.221	.44	.6700	.217	2.04	.9793	.008			
-1.12	.1314	1.186	.48	.6844	.204	2.08	.9812	.007			
-1.08	.1401	1.151	.52	.6985	.192	2.12	.9830	.006			
-1.04	.1492	1.117	.56	.7123	.180	2.16	.9846	.005			
-1.00	.1587	1.083	.60	.7257	.169	2.20	.9861	.005			
-.96	.1685	1.049	.64	.7389	.158	2.24	.9875	.004			
-.92	.1788	1.017	.68	.7517	.148	2.28	.9887	.004			
-.88	.1894	0.984	.72	.7642	.138	2.32	.9898	.003			
-.84	.2005	0.952	.76	.7764	.129	2.36	.9909	.003			

Service level — z-scale

Table of Standard Normal Probabilities for Positive Z-scores

Table of Standard Normal Probabilities

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Note that the probabilities given in this table represent the area to the **LEFT** of the z-score.
The area to the RIGHT of a z-score = 1 – the area to the LEFT of the z-score

Table of Standard Normal Probabilities for Negative Z-scores

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

CINEC CAMPUS
Beyond A Graduate

Faculty of Management and Social Sciences
Department of Management and Business Studies
BSc (Hons) in Business and Industrial Mathematics
Course CODE: BSc 562

Year 2 Semester II
SEMESTER END EXAMINATION
Procurement Management - BBIM 2310

- This paper consists of EIGHT (08) questions on SIX (06) pages.
- Answer <u>FIVE (05)</u> questions including question 01.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2022.03.22   Pass mark: 40%   Time: 03 Hours

Question 01 (Compulsory)

Strategic analysis means the process of handling research on a company and its operating environment to formulate a strategy. The definition of strategic analysis may differ from an academic or business perspective, but the process involves several common factors. Strategy is the grand design or an overall 'plan', which an organization selects in order to move or react towards the set objectives by using its resources. Strategic procurement ensures timely supply of goods and services in line with the organization's business goals, while reducing risk within the supply chain.

(a) Companies prefer using strategic procurement for a number of reasons.

    (i)   Define the term "strategy".   (01 Mark)

    (ii)   What are the common factors involving in strategic analysis?   (02 Marks)

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(iii) Give three methodologies which are used to study the market efficiently.

(02 Marks)

(iv) It is recommended to use SMART goals when setting up your procurement strategy. What does mean by SMART here? (02 Marks)

(v) Name main three types of purchasing systems used in different organizations. (02 Marks)

(vi) What does mean by "purchasing devolution". (01 Mark)

(b) "The Kraljic Portfolio purchasing model was formed by Peter Kraljic and it appeared in the Harvard Business Review in 1983".

(i) Draw a basic matrix diagram of Kraljic portfolio model. (06 Marks)

(ii) Write the characteristics of bottleneck items with appropriate examples.

(04 Marks)

Question 02

Acquisition of external resources by the government using public funds, grants & gifts under public procurement rules is the scope of public procurement management. It doesn't mean solely that pubic body – buying something. The purpose of public procurement may be making value for money.

(a) Governments are expected to carry it out efficiently and with high standards of conduct in order to ensure high quality of service delivery and safeguard the public interest.

(i) Point out five major public procurement objectives. (04 Marks)

(ii) Define the term "contract". (01 Marks)

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(iii)   Name five key contract pricing mechanisms.   (05 Marks)

(b) Explain new developments in public sector procurement.   (10 Marks)

Question 03

It is of high importance to acquire resources of the right quality, delivered at the right quantity, to the right place, at the right time and even more important at the right price. The buyer doesn't look at the price the same way the seller does. To a buyer, price is an element in the total cost of ownership and this will be compared to the value of the product or service which has to offer.

(a) Divide factors affecting pricing decisions into internal & external factors (Five factors per each).   (10 Marks)

(b) Illustrate price analysis and cost analysis separately.   (10 Marks)

Question 04

International trade is the exchange of goods and services between countries or else economic transactions that are made between countries. Global sourcing is one part of international trade. Sourcing overseas refers to buying materials, products or services from manufacturers or suppliers that are located outside of your home country. Nowadays, a large number of organizations consider sourcing as a viable option for cutting down their expenses. However, the procurement journey of organizations is not

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so simple as it may seem. Large-size business firms especially MNCs face numerous hardships when they try to customize their cross-border sourcing activities. Incoterms are incorporated in contracts for the delivery of goods worldwide and provide guidance to importers, exporters, lawyers, transporters, insurers and students of international trade.

(a) When global sourcing being practiced, agreeing to correct INCOTERMS is a must.

    (i)   INCOTERMS are segregated into two different types mainly. What are they?   (02 Marks)

    (ii)   Give four INCOTERMS for the above types given in (i).   (08 Marks)

(b) Explain why international sourcing is needed.   (10 Marks)

Question 05

Choose the wrong supplier and you could face shipping delays, poor quality and product returns. But choose the right supplier and you'll be on your way to quality products and satisfied customers. When you're trying to find a manufacturer to produce your consumer products, due diligence is essential. You need to look for a supplier that matches your business needs as closely as possible.

(a) One of procurement's most important duties has been identifying and aligning their organizations with reliable suppliers. These sources not only have to meet shipping timelines, pricing parameters, and quality standards, but the best ones also have to be able to do this over and over again on a long-term basis.

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(i)   List down five most important attributes to focus on during your supplier
      search?   (05 Marks)

(ii) Give five different types of sourcing.   (05 Marks)

(b) Sourcing process is a strategic movement with sequence of steps. Justify the
    statement using proper examples & knowledge.   (10 Marks)

Question 06

You are the procurement manager in a small manufacturing organization. The company
is considering moving towards an E-procurement system. Imagine that you are assigned
to write a report to be submitted to the CEO of the company, elaborating below
mentioned;

(a) Define the term E-procurement.   (04 Marks)

(b) Write the benefits of E-procurement using appropriate examples.   (09 Marks)

(c) List the barriers for E-procurement in third world countries.   (07 Marks)

Question 07

(a) Define the term 'Outsourcing' with examples.   (03 Marks)

(b) Identify the benefits of outsourcing.   (05 Marks)

(c) Identify the pitfalls of outsourcing.   (05 Marks)

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(d) List the precautions which should be taken by the organizations proactively in order to make sure that the concept of outsourcing theory works in their organization.   (07 Marks)

Question 08

Write short notes for selected four topics.   (05 Marks*4 = 20 Marks)

   (a) Total Cost Ownership

   (b) Hedging with Future Contracts

   (c) Hard Commodities

   (d) Problems in International Sourcing

   (e) Types of Capital Equipment

   (f) Negotiation Strategies

--------------------END OF THE QUESTION PAPER----------------

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Year 2 Semester II
SEMESTER END EXAMINATION
E- Commerce - BBIM 2308

- This paper consists of EIGHT (08) questions on SEVEN (07) pages.
- Answer FIVE (05) questions including question 01.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2022.03.16   Pass mark: 40%   Time: 03 Hours

Question 01 (Compulsory)

a) What are the four generic strategies for achieving a profitable business.

(02 Marks)

b) Give two examples for disruptive technologies.   (02 Marks)

c) Write down one strength and one weakness of online payments.   (02 Marks)

d) Who are the five parties involved in online credit card transactions?   (02 Marks)

e) What is the use of encryption?   (02 Marks)

f) Write down two responsibilities of ICTA.   (02 Marks)

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g) List four candidate ethical principles.   (02 Marks)

h) What are the four major dimensions of ethical, social and political issues.

                                                                              (02 Marks)

i) Why some people don't shop online? Briefly explain two reasons.   (02 Marks)

j) Write down four functions of a firm's website.   (02 Marks)

Question 02

a) What is E commerce and the role of E commerce in today's society.   (06 Marks)

b) What is the difference between e commerce and e business.   (04 Marks)

c) List out the major differences between B2C and B2B business models.

                                                                              (04 Marks)

d) Briefly explain three unique features of e commerce technology using examples.

                                                                              (06 Marks)

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Question 03

a) Briefly explain what is a business model. (04 Marks)

b) List down two features of each of the following B2B business models that help to connect trading partner community. (04 Marks)

- Direct Connection B2B Model
- Hybrid B2B Model

c) Discuss the features of three types of major B2C business models using examples. (06 Marks)

d) Discuss the features of three types of major B2B business models using examples. (06 Marks)

Question 04

a) List three differences between online store and a physical store. (03 Marks)

b) Briefly explain the online credit card transaction process. (08 Marks)

c) Briefly explain three limitations of online credit card transaction process. (06 Marks)

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d) List down three other online payment systems apart from credit cards.

(03 Marks)

Question 05

a) What is a ecommerce business strategy (02 Marks)

b) Select any two (2) generic strategies for achieving profitable business and explain about them using suitable examples. (08 Marks)

c) Analyse online clothing industry by using Porter's five forces model. (10 Marks)

Question 06

Online giant eBay provides the world's largest online marketplace. eBay owns the largest online banking service, PayPal, which is used to facilitate transactions between online buyers and sellers. Unfortunately, managing the largest online bank and marketplace makes eBay a huge target for hackers and fraudsters. Credit/debit card fraud, computer fraud, confidence fraud, and financial institutions fraud round out the top seven categories of complaints referred to law enforcement during recent years.

For an instance, a Romanian hacker called Vladuz who hacked into eBay systems and masqueraded as an official eBay representative. The damage Vladuz caused is estimated at 1 million dollars. He was eventually apprehended and awaits trial.

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However, eBay keeps fraud under control by investing heavily in information security tools and practices. On its web site, eBay states that PayPal uses "the world's most advanced proprietary fraud prevention systems to create a safe payment solution." The company also invests in an automated security system to keep hackers out of the network. The system uses more than a dozen scanning applications to monitor vulnerabilities on eBay's global network and on all partner networks that connect to eBay's extranet. The security software that patrols eBay's systems provides continuous reports to security engineers. The software also creates reports for system administrators and executives that provide an overview of network conditions and illustrate the impact of information security investment. Additionally, the security software measures eBay's compliance with government regulations involving information security. The battle to protect valuable and private information online is one in which all levels of management in businesses and governments are or should be fully engaged.

a) What do you mean by a computer crime? (04 Marks)

b) What is eBay? (04 Marks)

c) Explain the type of computer crimes that eBay is basically experiencing.

(04 Marks)

d) Who is a hacker? Explain with example from case. (02 Marks)

e) Explain three security measures taken by eBay to control internet related computer crimes. (06 Marks)

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Question 07

One of the success stories of digitalization of government services in Sri Lanka is the E-Hospital project conducted in the Western Province installing successful hospital information system. Now there are 3 institutions which have implemented this system, DH Dompe, BH Avissawella, and BH Panadura respectively.

In these hospitals, Hospital Health Information and Management System (HHIMS) runs which gives benefit to both patient and hospital employees. In this system, all the patients can get a bar-coded electronic health card, for free of charge after entering data in the first visit and also subsequent visits. This system ultimately guides to have a complete medical record for each patient.

This system also connects to the dispensary to drug dispensing. In Dompe hospital, this system develops to take electronic appointment system also.

a) What are the major management challenges that might occur when implementing this type of project in Sri Lanka? (05 Marks)

b) Discuss the merits and demerits in terms of
   I.   Security
   II. ethical considerations
   III. customer experience

   with reference to the patients and hospital staff in this type of project?

   (10 Marks)

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c) List out five potential business opportunities that could derive from this
business model.   (05 Marks)

Question 08

Write short notes.   (4*05 Marks)

   a) Frauds in online credit card transactions

   b) Tension between eCommerce security and other values.

   c) Role of ICTA

   d) What will the Marketing look like in 2030?

--------------------*END OF THE QUESTION PAPER*-----------------