UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE NAME	:	MANAGEMENT SCIENCE II
COURSE CODE	:	BPB 20603
PROGRAMME	:	2 BPA
EXAMINATION DATE	:	JUNE 2012
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 A publishing company produces books for the retail market. Demand for a current book is expected to occur at a constant annual rate of 7 400 copies. The cost of one copy of the book is RM16.50. The holding cost is based on a 20% annual rate, and production setup costs are RM170 per setup. The equipment on which the book is produced has an annual production volume of 27 000 copies. The company has 250 working days per year, and the lead time for a production run is 15 days.

Compute the following values in the production lot size model:

(a) Minimum cost production lot size;

(5 marks)

(b) Number of production runs per year;

(2 marks)

(c) Cycle time;

(2 marks)

(d) Length of a production run;

(2 marks)

(e) Maximum inventory;

(2 marks)

(f) Total annual cost;

(5 marks)

(g) Reorder point.

(2 marks)

Q2 A craft shop sells a variety of quality handmade items to tourists. The shop will sell 300 hand-carved miniature replicas of a soldier each year, but the demand pattern during the year is uncertain. The replicas sell for RM20 each, and the shop uses a 15% annual inventory holding cost rate. Ordering costs are RM5 per order, and demand during the lead time follows a normal probability distribution with $\mu = 15$ and $\sigma = 6$.

(a) Calculate the optimal order quantity.

(5 marks)

(b) Calculate the reorder point if the shop is willing to accept a stock-out roughly twice a year.

(10 marks)

(c) Determine the annual safety stock costs for this product.

(5 marks)

Q3 A company of plumbing and heating maintains a stock of 30-gallon hot water heaters that it sells to homeowners and installs for them. The company's executive likes the idea of having a large supply on hand to meet customer demand, but he also recognizes that it is expensive to do so. He examines hot water sales over the past 50 weeks as given in **Table Q3**.

Table Q3: Hot water sales

Hot Water Heater Sales per Week	Number of Weeks This Number Was Sold
4	6
5	5
6	9
7	12
8	8
9	7
10	3

(a) Assume a constant supply of 8 hot water heaters in any given week. Calculate the number of stockouts during a 10-week simulation using the random numbers (0.0007, 0.8674, 0.2003, 0.5466, 0.4338, 0.8242, 0.9087, 0.9272, 0.1220, and 0.3187).

(10 marks)

(b) Calculate the average number of sales per week, including stockouts, over 10-week period.

(2 marks)

(c) Calculate the expected number of sales per week using an analytic non-simulation technique.

(8 marks)

Q4 Table Q4 shows profit for a decision analysis problem with two decision alternatives and three states of nature.

Table Q4: Payoff table

Decision Alternative	State of Nature		
	s_1	s_2	s_3
d_1	250	100	25
d_2	100	100	75

(a) Illustrate a decision tree for this problem.

(10 marks)

(b) Suppose that the decision maker obtained the probability assessments given below:

$$P(s_1) = 0.65,\ P(s_2) = 0.15,\ \text{and}\ P(s_3) = 0.20.$$

Determine the optimal decision by using the expected value approach.

(10 marks)

Q5 A university administers computer competency examinations every year. These exams allow students to exempt from taking the introductory computer class held at the university. Results of the exams can be placed in one of the following four states:

State 1. Pass all of the computer exams and be exempt from the course
State 2. Do not pass all of the computer exams on the third attempt and be required to take the course
State 3. Fail the computer exams on the first attempt
State 4. Fail the computer exams on the second attempt

The course coordinator for the exams has noticed the following matrix of transition probabilities:

$$P = \begin{bmatrix} 1.0 & 0.0 & 0.0 & 0.0 \\ 0.0 & 1.0 & 0.0 & 0.0 \\ 0.8 & 0.0 & 0.1 & 0.1 \\ 0.2 & 0.2 & 0.4 & 0.2 \end{bmatrix}$$

Currently, there are 200 students who did not pass all of the exams on the first attempt. In addition, there are 50 students who did not pass on the second attempt.

From 250 students, calculate the number of students who will be exempted from the course by passing the exams and who will be required to take the computer course in the long-run.

(20 marks)

END OF QUESTION PAPER

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ECONOMIC PRODUCTION LOT SIZE MODEL

Optimal order quantity $Q^* = \sqrt{\frac{2DC_o}{(1-D/P)C_h}}$

Annual holding cost $= \frac{1}{2}\left(1-\frac{D}{P}\right)QC_h$

Annual ordering cost $= \frac{D}{Q}C_o$

Total annual cost $= \frac{1}{2}\left(1-\frac{D}{P}\right)QC_h + \frac{D}{Q}C_o$

Maximum inventory level $= \left(1-\frac{D}{P}\right)Q$

Average inventory level $= \frac{1}{2}\left(1-\frac{D}{P}\right)Q$

Reorder point $R = d \times L$

Number of orders per year $N = \frac{D}{Q}$

Cycle time $T = \frac{Q}{D}W$

Production run length $t = \frac{Q}{P}W$

PROBABILISTIC DEMAND: SINGLE PERIOD INVENTORY MODEL

P(Stock-out) $= \frac{N_S}{N}$

$P(\text{Demand} \leq Q^*) = \frac{C_u}{C_u + C_o} = \alpha$

Optimal order quantity $Q^* = \mu + z_\alpha \cdot \sigma$

Reorder point $R = \mu + z_\alpha \cdot \sigma$

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TABLE 3 AREA IN TAIL OF THE NORMAL DISTRIBUTION

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	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.02275	0.02222	0.02169	0.02118	0.02068	0.02018	0.01970	0.01923	0.01876	0.01831
2.1	0.01786	0.01743	0.01700	0.01659	0.01618	0.01578	0.01539	0.01500	0.01463	0.01426
2.2	0.01390	0.01355	0.01321	0.01287	0.01255	0.01222	0.01191	0.01160	0.01130	0.01101
2.3	0.01072	0.01044	0.01017	0.00990	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842
2.4	0.00820	0.00798	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100