朝陽科技大學 100 學年度碩士班招生考試試題

系（所）別：工業工程與管理系　　**總分：100 分**
組　　別：一般生
科　　目：生產管理　　

1. The $\bar{x}$ chart with 3-sigma control limits are used to monitor the process mean. Assume the sample size is 5 and the quality characteristic is normally distributed. If the process mean shifts from the in-control value (μ_0) to another value ($\mu_1 = \mu_0 + 2\sigma$), then find out the type II error (β). **[10%]**

2. Samples of size $n = 5$ are taken from a manufacturing process every hour. A quality characteristic is measured, and $\bar{x}$ and R are computed for each sample. After 25 samples have been analyzed, we have (Note: $A_2 = 0.577$ ， $D_4 = 2.114$ ， $D_3 = 0$ ， $d_2 = 2.326$) **[16%]**

$$\sum_{i=1}^{25} \bar{x}_i = 662.50 \text{ and } \sum_{i=1}^{25} R_i = 9.00$$

The quality characteristic is normally distributed.

(a) Find the center lines and control limits for the $\bar{x}$ and R charts [6%]

(b) Assume that both charts exhibit in-control, estimate the process mean and standard deviation. [10%]

3. 某流程計算 C_p 與 C_{pk} 估計流程之能力，若所計算出來之結果如下所列，請分別說明其代表之意思：

(a) $C_p = C_{pk}$ (b) $C_p > C_{pk}$ (c) $C_{pk} = 0$ (d) $C_{pk} < 0$ **[8%]**

4. 設有一軸心與軸承的組件，其軸承的內徑為 X_1 符合常態分配 $N(25, (3)^2)$，軸心外徑為 X_2 也符合常態分配 $N(20, (4)^2)$，若軸承內徑與軸心外徑之差大於 6 則會發生搖晃之情形，則發生組件搖晃的機率為何？ **[6%]**

5. 選擇題（單選: 2 points each) **[10%]**

Notation given below is for the following inventory management (economic order quantity (EOQ) and economic production quantity (EPQ)) problems:

P : production rate per year　　λ: the demand rate per year　　c: unit production cost
K : fixed setup/ordering cost　　h: holding cost /item/year　　T^*: optimal cycle time (length)
Q^*: optimal order/production size　　$G(Q^*)$: total cost per year　　R: reorder point
τ: order lead time

(1) In the conventional EOQ model when h increases then:
(a) Q^* decreases　**(b)** T^* increases　**(c)** K increases　**(d)** P decreases.

(2) In the conventional EOQ model when $\tau < T^*$ then:
(a) $R = 0$　**(b)** $R = \lambda Q^*$　**(c)** $R = \lambda\tau$　**(d)** $R = Q^*$.

(3) In the conventional EPQ model when λ increases then:
(a) K increases　**(b)** Q^* increases　**(c)** P decreases　**(d)** T^* decreases.

(4) In the conventional EOQ model when K increases then:
(a) h increases　**(b)** P increases　**(c)** Q^* decreases　**(d)** T^* increases.

(5) In comparison of the optimal lot sizes of the EOQ model (Q_1^*) and EPQ model (Q_2^*), if all corresponding parameters have the same values, then:
(a) $Q_1^* = Q_2^*$　**(b)** $Q_1^* < Q_2^*$　**(c)** $Q_1^* > Q_2^*$　**(d)** It depends.

6. If the time-phased net requirements for the base assembly in a table lamp over the next 6 weeks are **[10%** = 5%+5%]

Week	1	2	3	4	5	6
Requirements	**160**	**220**	**180**	**100**	**200**	**240**

The setup cost for the construction of the base assembly is \$320, and the holding cost is \$0.50 per assembly per week. Determine **(A)** the lot sizes and **(B)** total costs using the **Silver-Meal** heuristic.

7. A product has the following requirements and production capacities for the next 7 weeks: **[12% = 6%+6%]**

Week	1	2	3	4	5	6	7
Requirements	**300**	**130**	**150**	**320**	**230**	**210**	**170**
Capacities	**450**	**450**	**100**	**100**	**450**	**100**	**100**

(A) Determine if the problem is feasible (i.e. the in-house capacities of this product are sufficient to satisfy the demand)? If it is feasible, please give the lot-for-lot initial solution.

(B) If setup cost is $105 and holding cost is $0.4 per item per week, use your initial solution in (A) and the lot-elimination heuristic to determine a lot-size solution.

8. 填空題 (3 points each) **[12%]**

CX Inc., a regional computer retailer store uses a simple forecasting method for weekly sales of the floppy disk drives. It is to form the average of the **three most recent sales figures** (i.e. Moving Average N=3). Suppose sales for the drives for the past 8 weeks were:

Week	1	2	3	4	5	6	7	8
Sales	454	535	474	548	501	492	520	488

(A) Determine the one-step-ahead forecasts made for weeks 7 and 8 using this method.

Answers: F_7=_____; F_8=_____.

(B) Calculate the Mean Squared Errors (MSE) for your above forecasts. ***Answer***: $MSE_{7\text{-}8}$=_____.

(C) Compute five-step-ahead forecast for week 9 using this method. ***Answer***: $F_{4,9}$=_____.

9. Seven jobs are to be processed through a single machine. Processing times and due dates are given below. **[16%]**

Job	1	2	3	4	5	6	7
Processing time	**3**	**8**	**5**	**11**	**10**	**6**	**9**
Due date	**10**	**23**	**18**	**50**	**30**	**14**	**33**

(A) Determine the sequence (排程之順序) and mean flow time (平均流程時間) of the jobs in order to minimize the mean waiting time. **[4%+4%]**

(B) Determine the sequence (排程之順序) & number of tardy jobs (延遲工作件數) of the jobs in order to minimize number of tardy jobs. **[4%+4%]**

~ The End of Problems ~

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系（所）別：工業工程與管理系　　總分：100分

組　　別：一般生

科　　目：生產管理　　第 4 頁 共 4 頁

$$\Phi(z) = P(Z \le z) = \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}\mu^2} d\mu$$

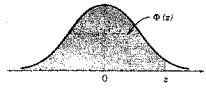

Table I. Cumulative Standard Normal Distribution

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.500000	0.503989	0.507978	0.511967	0.515953	0.519939	0.532922	0.527903	0.531881	0.535856
0.1	0.539828	0.543795	0.547758	0.551717	0.555760	0.559618	0.563559	0.567495	0.571424	0.575345
0.2	0.579260	0.583166	0.587064	0.590954	0.594835	0.598706	0.602568	0.606420	0.610261	0.614092
0.3	0.617911	0.621719	0.625516	0.629300	0.633072	0.636831	0.640576	0.644309	0.648027	0.651732
0.4	0.655422	0.659097	0.662757	0.666402	0.670031	0.673645	0.677242	0.680822	0.684386	0.687933
0.5	0.691462	0.694974	0.698468	0.701944	0.705401	0.708840	0.712260	0.715661	0.719043	0.722405
0.6	0.725747	0.729069	0.732371	0.735653	0.738914	0.742154	0.745373	0.748571	0.751748	0.754903
0.7	0.758036	0.761148	0.764238	0.767305	0.770350	0.773373	0.776373	0.779350	0.782305	0.785236
0.8	0.788145	0.791030	0.793892	0.796731	0.799546	0.802338	0.805106	0.807850	0.810570	0.813267
0.9	0.815940	0.818589	0.821214	0.823815	0.826391	0.828944	0.831472	0.833977	0.836457	0.838913
1.0	0.841345	0.843752	0.846136	0.848495	0.850830	0.853141	0.855428	0.857690	0.859929	0.862143
1.1	0.864334	0.866500	0.868643	0.870762	0.872857	0.874928	0.876976	0.878999	0.881000	0.882977
1.2	0.884930	0.886860	0.888767	0.890651	0.892512	0.894350	0.896165	0.897958	0.899727	0.901475
1.3	0.903199	0.904902	0.906582	0.908241	0.909877	0.911492	0.913085	0.914657	0.916207	0.917736
1.4	0.919243	0.920730	0.922196	0.923641	0.925066	0.926471	0.927855	0.929219	0.930563	0.931888
1.5	0.933193	0.934478	0.935744	0.936992	0.938220	0.939429	0.940620	0.941792	0.942947	0.944083
1.6	0.945201	0.946301	0.947384	0.948449	0.949497	0.950529	0.951543	0.952540	0.953521	0.954486
1.7	0.955435	0.956367	0.957284	0.958185	0.959071	0.959941	0.960796	0.961636	0.962462	0.963273
1.8	0.964070	0.964852	0.965621	0.966375	0.967116	0.967843	0.968557	0.969258	0.969946	0.970621
1.9	0.971283	0.971933	0.972571	0.973197	0.973810	0.974412	0.975002	0.975581	0.976148	0.976705
2.0	0.977250	0.977784	0.978308	0.978822	0.979325	0.979818	0.980301	0.980774	0.981237	0.981691
2.1	0.982136	0.982571	0.982997	0.983414	0.983823	0.984222	0.984614	0.984997	0.985371	0.985738
2.2	0.986097	0.986447	0.986791	0.987126	0.987455	0.987776	0.988089	0.988396	0.988696	0.988989
2.3	0.989276	0.989556	0.989830	0.990097	0.990358	0.990613	0.990863	0.991106	0.991344	0.991576
2.4	0.991802	0.992024	0.992240	0.992451	0.992656	0.992857	0.993053	0.993244	0.993431	0.993613
2.5	0.993790	0.993963	0.994132	0.994297	0.994457	0.994614	0.994766	0.994915	0.995060	0.995201
2.6	0.995339	0.995473	0.995604	0.995731	0.995855	0.995975	0.996093	0.996207	0.996319	0.996427
2.7	0.996533	0.996636	0.996736	0.996833	0.996928	0.997020	0.997110	0.997197	0.997282	0.997365
2.8	0.997445	0.997523	0.997599	0.997673	0.997744	0.997814	0.997882	0.997948	0.998012	0.998074
2.9	0.998134	0.998193	0.998250	0.998305	0.998359	0.998411	0.998462	0.998511	0.998559	0.998605
3.0	0.998650	0.998694	0.998736	0.998777	0.998817	0.998856	0.998893	0.998930	0.998965	0.998999
3.1	0.999032	0.999065	0.999096	0.999126	0.999155	0.999184	0.999211	0.999238	0.999264	0.999289
3.2	0.999313	0.999336	0.999359	0.999381	0.999402	0.999423	0.999443	0.999462	0.999481	0.999499
3.3	0.999517	0.999533	0.999550	0.999566	0.999581	0.999596	0.999610	0.999624	0.999638	0.999650
3.4	0.999663	0.999675	0.999687	0.999698	0.999709	0.999720	0.999730	0.999740	0.999749	0.999758
3.5	0.999767	0.999776	0.999784	0.999792	0.999800	0.999807	0.999815	0.999821	0.999828	0.999835
3.6	0.999841	0.999847	0.999853	0.999858	0.999864	0.999869	0.999874	0.999879	0.999883	0.999888
3.7	0.999892	0.999896	0.999900	0.999904	0.999908	0.999912	0.999915	0.999918	0.999922	0.999925
3.8	0.999928	0.999931	0.999933	0.999936	0.999938	0.999941	0.999943	0.999946	0.999948	0.999950
3.9	0.999952	0.999954	0.999956	0.999958	0.999959	0.999961	0.999963	0.999964	0.999966	0.999967