國立成功大學

113學年度碩士班招生考試試題

編　號：189

系　所：製造資訊與系統研究所

科　目：生產管理

日　期：0201

節　次：第 2 節

備　註：不可使用計算機

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※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. An electronic gadgets store requires the following minimum number of employees, each of whom is required to have two consecutive days off.

Day:	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.	Sun.
Minimum employees required:	9	2	8	6	9	1	3

If there are no day offs provided on Thursday and Friday, the number of employees required to work on Thursday as per the final employee schedule is_____ ? **(20%)**

2. Airplanes arrive for take-off at the runway of an airport according to a Poisson process at a mean rate of 20 per hour. The time required for an airplane to take off has an exponential distribution with a mean of 2 minutes, and this process must be completed before the next airplane can begin to take off. Because a brief thunderstorm has just begun, all airplanes which have not commenced take-off have just been grounded temporarily. However, airplanes continue to arrive at the runway during the thunderstorm to await its end. Assuming steady-state operation before the thunderstorm, determine the expected number of airplanes that will be waiting to take off at the end of the thunderstorm if it lasts 30 minutes. **(20%)**

3. Bill Fredlund, president of Lincoln Log Construction, is considering placing a bid on a building project. Bill has determined that five tasks would need to be performed to carry out the project. Using the PERT three-estimate approach, Bill has obtained the estimates in the next table for how long these tasks will take. Also shown are the precedence relationships for these tasks.

Task	Time Required			Immediate Predecessors
	Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate	
A	3 weeks	4 weeks	5 weeks	—
B	2 weeks	2 weeks	2 weeks	*A*
C	3 weeks	5 weeks	6 weeks	*B*
D	1 week	3 weeks	5 weeks	*A*
E	2 weeks	3 weeks	5 weeks	*B, D*

There is a penalty of $500,000 if the project is not completed in 11 weeks. Therefore, Bill is very interested in how likely it is that his company could finish the project in time.

(a)Find the mean critical path. **(10%)**

(b)Find the approximate probability of completing the project within 11 weeks. **(10%)**

4. Vision Toys uses a fixed-quantity system to manage its inventories. The inventory includes plastic and LED bulbs. It was observed that the company often faces stockout of plastic. The average weekly demand for plastic is 100 pounds, and historical data show that the standard deviation of weekly demand is about 7. The lead time from the plastic supplier is 2 weeks. If the company's acceptable service level is 95 percent and the number of standard deviations necessary to achieve the acceptable service level is 1.645, the reorder point for plastic with safety stock is ___ ? **(20%)**

5. AlwaysRain Irrigation, Inc., would like to determine capacity requirements for the next four years. Currently two production lines are in place for making bronze and plastic sprinklers. Three types of sprinklers are available in both bronze and plastic: 90-degree nozzle sprinklers, 180-degree nozzle sprinklers, and 360-degree nozzle sprinklers. Management has forecast demand for the next four years as follows:

	YEARLY DEMAND			
	1 (IN 000S)	2 (IN 000S)	3 (IN 000S)	4 (IN 000S)
Plastic 90	32	44	55	56
Plastic 180	15	16	17	18
Plastic 360	50	55	64	67
Bronze 90	7	8	9	10
Bronze 180	3	4	5	6
Bronze 360	11	12	15	18

Both production lines can produce all the different types of nozzles. The bronze machines needed for the bronze sprinklers require two operators and can produce up to 12,000 sprinklers. The plastic injection molding machine needed for the plastic sprinklers requires four operators and can produce up to 200,000 sprinklers. Three bronze machines and only one injection molding machine are available. What are the capacity requirements of the plastic and bronze for the fourth year? (Assume that there is no learning.) **(20%)**

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Appendix: Cumulative Standard 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	0.500000	0.503989	0.507978	0.511967	0.515953	0.519939	0.523922	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