



**In this test, there are 20 multiple choice questions with 5 points for each question. Please select the correct answer for each question.**

1. An U.S. southern state has night state universities in its system. The numbers of volumes (in thousands) held in their libraries are 83, 510, 33, 256, 856, 1085, 401, 47, and 23. The standard deviation of the numbers of volumes of the seven state universities is:  
(A) 133502.54 (B) 365.38 (C) 387.54 (D) 150187.25 (E) 1201498.00
2. A fair coin is tossed three times and the events X and Y are defined as follows:  
X: {At least one head is observed}  
Y: {The number of heads observed is odd}  
What is the probability of  $P(X \cap Y)$ ?  
(A) 7/8 (B) 6/8 (C) 5/8 (D) 4/8 (E) 3/8
3. The New York Yankees baseball team plays 80 percent of their games at night and 20 percent during the day. The team wins 60 percent of their night games and 70 percent of their day games. According to today's newspaper, they won yesterday. What is the probability the game was played at night?  
(A) 60% (B) 70% (C) 77% (D) 87% (E) 92%
4. Ten percent of new automobiles will require warranty service within the first year. Jones Honda sells 12 automobiles in April. What is the probability that less than two automobiles require warranty service?  
(A) 0.23013 (B) 0.28243 (C) 0.37657 (D) 0.65900 (E) 0.88913
5. A recent study by the Taiwan Highway Patrolman's Association revealed that 60 percent of Taiwanese back-seat passengers use their seat belts. A sample of 10 back-seat passengers in Taipei is selected. What is the probability that 8 or fewer of the back-seat passengers are wearing seat belts?  
(A) 0.99395 (B) 0.95969 (C) 0.95364 (D) 0.87907 (E) 0.83271
6. A study of the lines at the checkout registers of Safeway Supermarket revealed that, during a certain period at the rush hour, the number of customers waiting averaged four. What is the probability that during the period four customers were waiting?  
(A) 0.165 (B) 0.175 (C) 0.185 (D) 0.195 (E) 0.205



7. A manufacturer of automobile batteries claims that the distribution of the lengths of life of its best battery has a mean of 55 months and a standard deviation of 6 months. Suppose a consumer group decides to check the claim by purchasing a sample of 50 of these batteries and subjecting them to tests that determine battery life. Assuming that the manufacturer's claim is true, what is the probability the consumer group's sample has a mean life of 53 or fewer months?  
(A) 0.0091 (B) 0.1291 (C) 0.3709 (D) 0.4909 (E) 0.5091
8. A cola-dispensing machine is set to dispense on average 7.00 ounces of cola per cup. The standard deviation is 0.10 ounces. What is the probability that a machine will dispense between 6.85 and 7.25 ounces of cola?  
(A) 0.4332 (B) 0.4938 (C) 0.8664 (D) 0.9270 (E) 0.9876
9. A study conducted by the Taurus Health Club revealed that 40 percent of its new members are significantly overweight. A membership drive in a metropolitan area resulted in 500 new members. What is the probability that 220 or more of the new members are overweight?  
(A) 0.0375 (B) 0.1760 (C) 0.4400 (D) 0.4625 (E) 0.0336
10. Suppose the President wants an estimate of the proportion of the population who support his current policy toward China. The President wants the estimate to be within 0.03 of the true proportion. Assume a 95 percent level of confidence. The Secretary of State estimated the proportion supporting current policy to be 0.40. How large a sample is required?  
(A) 722 (B) 1025 (C) 1068 (D) 1667 (E) 2400

**Use the following problem to answer questions 11-14.**

How well do airline companies serve their customers? A study showed the following customer ratings: 3% excellent, 28% good, 45% fair, and 24% poor. In a similar study of service by telephone companies, assume that a sample of 400 adults found the following customer ratings: 24 excellent, 124 good, 172 fair, and 80 poor. Is the distribution of the customer ratings for telephone companies different from the distribution of customer ratings for airline companies? Test at  $\alpha = .05$ .

11. Which of the following methods will you properly suggest?  
(A) t-test (B) z-test (C) Regression analysis (D) ANOVA (E) Chi-square test



12. Which null hypothesis is being tested?
- (A)  $H_0: \mu_d = 0$ .
- (B)  $H_0: \mu_1 - \mu_2 = 0$ .
- (C)  $H_0: P_1 - P_2 = 0$ .
- (D)  $H_0: P_1 = 0.03, P_2 = 0.28, P_3 = 0.45, P_4 = 0.24$
- (E) Customer ratings for airline companies and telephone companies are independent.
13. The critical value of the test is
- (A) 7.815      (B) 2.3534      (C) 1.96      (D) 2.7764      (E) 1.645
14. The calculated value for the test statistic equals
- (A) 16.84      (B) 11.34      (C) 11.07      (D) 5.99      (E) 4.37

Use the following problem to answer questions 15-17.

A firm would like to develop a regression model to forecast its yearly sales in each of its sales regions. The firm has decided to base its forecast on regional population size ( $x_1$ ) and its yearly regional advertising expenditures ( $x_2$ ). Two models are fit to data collected from  $n=24$  and which are

Full model:  $E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_1 x_2 + \beta_4 x_1^2 + \beta_5 x_2^2$  (SSE=159.94)

Reduced Model:  $E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$  (SSE=309.44)

15. What hypothesis would you test to determine which model is better?
- (A)  $H_0: \beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ .
- (B)  $H_0: \beta_0 = \beta_1 = \beta_2 = 0$ .
- (C)  $H_0: \beta_3 = \beta_4 = \beta_5 = 0$ .
- (D)  $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ .
- (E)  $H_0: \beta_1 = \beta_2 = 0$ .
16. What is the value of the test statistic for concluding that the full model contributes more information for the prediction of  $y$  than does the reduced model?
- (A) 1.88      (B) 5.61      (C) 8.89      (D) 16.68      (E) 14.95
17. The critical value of the test is
- (A) 28.869      (B) 2.3534      (C) 1.96      (D) 3.16      (E) 1.645



Use the following problem to answer questions 18-19

Researchers studied the attitudes of three groups of professionals that influence U.S. policy governing new technologies: Scientists, Journalists, and Federal government policymakers. Random samples of 21 scientists, 21 journalists, and 21 government officials were asked about the safety of nuclear power plants. Response were make on a seven-point scale, where 1=very unsafe and 7=very safe. The mean safety scores for the groups are scientists, 4.1; journalists, 3.7; government officials, 4

18. How many treatments are included in this study?  
(A) 7            (B) 21            (C) 3            (D) 4            (E) 2
19. The MSE for the sample data is 2.355 and the SST (treatment) for the sample is 22.56. What is the test statistic if we want to test whether there are differences in the attitudes of scientists, journalists, and government officials regarding the safety of nuclear power plants?  
(A) 3.15            (B) 2.355            (C) 8.89            (D) 11.28            (E) 4.79
20. A researcher was interested in comparing the salaries of female and male employees of a particular company. Independent random samples of 8 female and 15 males yielded the following weekly salaries (in dollars).

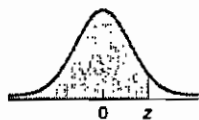
Female	Male	
495	722	518
760	562	904
556	880	1150
904	520	805
520	500	480
1005	1250	970
743	750	605
660	1640	

Determine a 98% confidence interval for the difference between the mean weekly salary of all females and males.

- (A) -\$385 to \$164            (B) -\$382 to \$158  
(C) -\$431 to \$208            (D) -\$383 to \$159  
(E) None of the above is true.

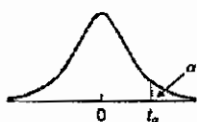


TABLE II (cont.)  
Areas under the  
standard normal curve



z	Second decimal place in 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
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000†									

† For  $z \geq 3.90$ , the areas are 1.0000 to four decimal places.


 TABLE IV  
 Values of  $t_\alpha$ 


df	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$	df
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.131	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
30	1.310	1.697	2.042	2.457	2.750	30
31	1.309	1.696	2.040	2.453	2.744	31
32	1.309	1.694	2.037	2.449	2.738	32
33	1.308	1.692	2.035	2.445	2.733	33
34	1.307	1.691	2.032	2.441	2.728	34
35	1.306	1.690	2.030	2.438	2.724	35
36	1.306	1.688	2.028	2.434	2.719	36
37	1.305	1.687	2.026	2.431	2.715	37
38	1.304	1.686	2.024	2.429	2.712	38
39	1.304	1.685	2.023	2.426	2.708	39
40	1.303	1.684	2.021	2.423	2.704	40
41	1.303	1.683	2.020	2.421	2.701	41
42	1.302	1.682	2.018	2.418	2.698	42
43	1.302	1.681	2.017	2.416	2.695	43
44	1.301	1.680	2.015	2.414	2.692	44
45	1.301	1.679	2.014	2.412	2.690	45
46	1.300	1.679	2.013	2.410	2.687	46
47	1.300	1.678	2.012	2.408	2.685	47
48	1.299	1.677	2.011	2.407	2.682	48
49	1.299	1.677	2.010	2.405	2.680	49


 TABLE VII (cont.)  
 Values of  $\chi^2_{\alpha}$ 

$\chi^2_{0.10}$	$\chi^2_{0.05}$	$\chi^2_{0.025}$	$\chi^2_{0.01}$	$\chi^2_{0.005}$	df
2.706	3.841	5.024	6.635	7.879	1
4.605	5.991	7.378	9.210	10.597	2
6.251	7.815	9.348	11.345	12.838	3
7.779	9.488	11.143	13.277	14.860	4
9.236	11.070	12.833	15.086	16.750	5
10.645	12.592	14.449	16.812	18.548	6
12.017	14.067	16.013	18.475	20.278	7
13.362	15.507	17.535	20.090	21.955	8
14.684	16.919	19.023	21.666	23.589	9
15.987	18.307	20.483	23.209	25.188	10
17.275	19.675	21.920	24.725	26.757	11
18.549	21.026	23.337	26.217	28.300	12
19.812	22.362	24.736	27.688	29.819	13
21.064	23.685	26.119	29.141	31.319	14
22.307	24.996	27.488	30.578	32.801	15
23.542	26.296	28.845	32.000	34.267	16
24.769	27.587	30.191	33.409	35.718	17
25.989	28.869	31.526	34.805	37.156	18
27.204	30.143	32.852	36.191	38.582	19
28.412	31.410	34.170	37.566	39.997	20
29.615	32.671	35.479	38.932	41.401	21
30.813	33.924	36.781	40.290	42.796	22
32.007	35.172	38.076	41.638	44.181	23
33.196	36.415	39.364	42.980	45.559	24
34.382	37.653	40.647	44.314	46.928	25
35.563	38.885	41.923	45.642	48.290	26
36.741	40.113	43.195	46.963	49.645	27
37.916	41.337	44.461	48.278	50.994	28
39.087	42.557	45.722	49.588	52.336	29
40.256	43.773	46.979	50.892	53.672	30
51.805	55.759	59.342	63.691	66.767	40
63.167	67.505	71.420	76.154	79.490	50
74.397	79.082	83.298	88.381	91.955	60
85.527	90.531	95.023	100.424	104.213	70
96.578	101.879	106.628	112.328	116.320	80
107.565	113.145	118.135	124.115	128.296	90
118.499	124.343	129.563	135.811	140.177	100



國立雲林科技大學  
96 學年度碩士班入學招生考試試題

系所：工管所、資管系

科目：統計學

TABLE VIII (cont.)  
Values of  $F_{\alpha}$

dfd	$\alpha$	dfn								
		1	2	3	4	5	6	7	8	9
17	0.10	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03
	0.05	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
	0.025	6.04	4.62	4.01	3.66	3.44	3.28	3.16	3.06	2.98
	0.01	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68
	0.005	10.38	7.35	6.16	5.50	5.07	4.78	4.56	4.39	4.25
18	0.10	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00
	0.05	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
	0.025	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.93
	0.01	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60
	0.005	10.22	7.21	6.03	5.37	4.96	4.66	4.44	4.28	4.14
19	0.10	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98
	0.05	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
	0.025	5.92	4.51	3.90	3.56	3.33	3.17	3.05	2.96	2.88
	0.01	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52
	0.005	10.07	7.09	5.92	5.27	4.85	4.56	4.34	4.18	4.04
20	0.10	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96
	0.05	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
	0.025	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84
	0.01	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
	0.005	9.94	6.99	5.82	5.17	4.76	4.47	4.26	4.09	3.96
21	0.10	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95
	0.05	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
	0.025	5.83	4.42	3.82	3.48	3.25	3.09	2.97	2.87	2.80
	0.01	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40
	0.005	9.83	6.89	5.73	5.09	4.68	4.39	4.18	4.01	3.88
22	0.10	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93
	0.05	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
	0.025	5.79	4.38	3.78	3.44	3.22	3.05	2.93	2.84	2.76
	0.01	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35
	0.005	9.73	6.81	5.65	5.02	4.61	4.32	4.11	3.94	3.81
23	0.10	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92
	0.05	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
	0.025	5.75	4.35	3.75	3.41	3.18	3.02	2.90	2.81	2.73
	0.01	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30
	0.005	9.63	6.73	5.58	4.95	4.54	4.26	4.05	3.88	3.75
24	0.10	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91
	0.05	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
	0.025	5.72	4.32	3.72	3.38	3.15	2.99	2.87	2.78	2.70
	0.01	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26
	0.005	9.55	6.66	5.52	4.89	4.49	4.20	3.99	3.83	3.69





注意：(1)計算過程請勿附上。

(2)請按照題號及子題號順序作答；不按題號順序作答不以計分。

I.是非題 (True (T) or False (F), 共二十分；答對一題得四分、答錯一題扣二分。)

- (1) The first phase problem of any linear programming problem (in two-phase simplex method) must have optimal solution.
- (2) If there is no entering variable at some iteration (in Simplex Method), then this linear programming problem is infeasible.
- (3) If a linear programming problem is feasible, its dual must be feasible.
- (4) If a transportation problem is balanced, it must has optimal integer solutions.
- (5) While solving a minimization integer programming problem (in branch and bound method), a subproblem with bound less than  $Z^*$  must be fathomed if the objective value of the current candidate solution is  $Z^*$ .

II.問答題(共八十分)

II.1 (十五分)

Suppose we use Simplex method to solve the following Linear Programming problem:

$$\begin{aligned}
 \max \quad & Z = 10x_1 + 8x_2 \\
 \text{s.t.} \quad & x_1 + x_2 - x_3 = 3 \\
 & 2x_1 - x_2 - x_4 = 2 \\
 & 2x_1 + 4x_2 + x_5 = 10 \\
 & x_1, x_2, x_3, x_4, x_5 \geq 0
 \end{aligned}$$

and obtain a simplex tabular:

Basic Variable	Z	$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	Right-Hand-Side
Z	1	0	(A)	*	0	0	(B)
*	0	1	*	*	0	0	*
(C)	0	0	*	*	1	0	*
*	0	0	*	*	0	1	*

- (A). What is the value (A) in above tabular? (3分)
- (B). What is the value (B) in above tabular? (3分)
- (C). What is the value (C) in above tabular? (3分)
- (D). What is the entering variable? (3分)
- (E). What is the leaving variable? (3分)



## II.2 (十五分)

Given the following Assignment problem ( $M$  represents as a very large number):

Machine	Job 1	Job 2	Job 3	Job 4
1	4	5	$M$	$M$
2	$M$	4	$M$	4
3	3	$M$	2	$M$
4	$M$	$M$	4	5

$$\text{Define } x_{ij} = \begin{cases} 1 & , \text{ if machine } i \text{ is assigned to perform job } j \\ 0 & , \text{ otherwise} \end{cases}$$

Consider this problem as a transportation problem with the following tabular. We force  $x_{12}$  to be a basic variable, and "Northwest Corner" Method is used to generate the initial basic feasible solution.

	1	2	3	4	Supply	$u_i$
1	4	5	$M$	$M$	*	(H)
2	$M$	4	$M$	4	*	0
3	3	$M$	2	$M$	*	*
4	$M$	$M$	4	5	*	*
Demand	*	*	(I)	*		
$v_j$	*	*	*	*		$Z =$

- (F). What are the basic variables in above tabular? (3分)
- (G). What are the values of basic variables? (3分)
- (H). What is the value of  $u_1$ ? (3分)
- (I). What is the value of (I) in above tabular? (3分)
- (J). What is the entering variable? (3分)



## II.3 (二十分)

Consider a service station with 2 different servers, server 1 and server 2 and waiting space of four (That is the maximum number of customers, including customers in service, in the service station is four). Customers arrive at the service station according to a Poisson process of rate  $\lambda$ . Arrivals who find the service station full leave the system immediately. Service time for server  $i$  is exponential with rate  $\mu_i$ ,  $i=1, 2$ . Assume that customers always choose server 1 for service whenever both servers are idle and once service with a server starts, the customer stays with that specific server until he completes his service. This system can be modeled as a Markov process with state space  $(m, I)$ , where  $m$  is number of customers in the system,  $I=0$  if server 2 is idle and  $I=1$  if server 2 is busy.

- (K). What is the state space of this Markov process? (5分)
- (L). Draw the transition rate diagram of this Markov process. (15分)

## II.4 (三十分)

A system is consisted of two units, unit 1 and unit 2. Assume that life time of unit  $i$  is exponential of rate  $\lambda_i$ ,  $i=1, 2$ .

- (M). When units 1 and 2 are in series then the system fails whenever one of the units fails. What is probability that the system failure is caused by failure of unit 1? (5分)
- (N). What is the distribution of time till system failure when units 1 and 2 are in series? (5分)
- (O). When units 1 and 2 are in parallel then the system fails when both units are down. What is the expected time till system failure? (10分)
- (P). Let unit 1 be the main component of the system and unit 2 be standby, then the system load is taken by unit 1 when both units are up. When unit 1 is operating, unit 2 is idle. Unit 2 takes up the system load immediately after failure of unit 1. What is the expected time till system failure? (10分)



試題說明：

- (A) 本試卷共有 25 題選擇題，每題四分，合計 100 分。選擇題有單選題與複選題。若是複選題，則以括號標註於題號右方；若無任何括號標註，則為單選題。  
 (B) 單選題請選擇最接近的答案。複選題的正確答案選項可能不只一個，全部答對該題才計分。

1. 在座標平面上，以 Center of Gravity 法尋找物流中心 D 的最佳位址座標，已知各設施的彼此間的運輸量及座標如下表所示，則物流中心的最佳座標  $(x, y)$  為何？

	設施	座標	TO			
			A	B	C	D
F	A	(0, 0)	—	10	0	5
R	B	(6, 10)	0	—	15	0
O	C	(20, 5)	5	8	—	15
M	D	(x, y)	5	5	0	—

- (A) (11, 4.17) (B) (3, 5) (C) (15, 3.75) (D) (6, 5) (E) (8.67, 5)

2. (複選題) 現有 A、B、C 三個設施，將以 Center of Gravity 法求設施 D 的最佳位置，假設流量資料均為已知。下列敘述何者正確？

- (A) Center of Gravity 法對距離的定義採用直線距離 (Euclidean Distance)  
 (B) Center of Gravity 法對距離的定義採用直角距離 (Rectilinear Distance)  
 (C) 設施 D 的最佳位置必定落在以 ABC 所圍成的三角形區域之內或邊線上  
 (D) 設施 D 的最佳位置必定落在 AB 直線上  
 (E) 設施 D 的最佳位置必定落在以 BC 為直徑的圓形區域之內或邊線上

3. 產品 P 及 Q 必需經由機器 A 加工生產。依照下表的生產資料，計算機器 A 的最適需求量。假設機器 A 每年可供加工的時間的為 500 小時、機器 A 的平均使用效率為 80%。

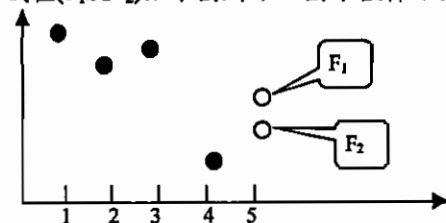
產品	年交貨量	加工時間(小時)	不良率(%)
P	1000	0.50	5%
Q	2000	0.75	10%

- (A) 3 (B) 4 (C) 5 (D) 6 (E) 7

4. (複選題) 下列有關於產能的敘述，何者正確？

- (A) Design Capacity 是指理論上的最大產能 (B) Efficiency = (Actual Output) / (Design Capacity)  
 (C) 當 Utilization = 100% 時，則 Efficiency 必達 100% (D) 當 Efficiency = 100% 時，則 Utilization 必達 100%  
 (E) Utilization 必定大於或等於 Efficiency

5. (複選題) 運用 Time Series 的相關預測方法，做第五期的銷售預測。過去四期的實際銷售量及第五期的銷售預測值  $(F_1)$  及  $(F_2)$  如下圖所示，圖中僅標示數值的相對大小。下列敘述何者正確？



- (A) 若預測值  $F_1$  及  $F_2$  均採用 Moving Average 法  $((\sum A_i)/n)$ ，則  $n_1 > n_2$   
 (B) 若預測值  $F_1$  及  $F_2$  均採用 Moving Average 法  $((\sum A_i)/n)$ ，則  $n_1 < n_2$   
 (C) 若預測值  $F_1$  及  $F_2$  均採用 Exponential Smoothing 法  $(F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1}))$ ，且  $F_2 = A_1$ ，則  $\alpha_1 > \alpha_2$   
 (D) 若預測值  $F_1$  及  $F_2$  均採用 Exponential Smoothing 法  $(F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1}))$ ，且  $F_2 = A_1$ ，則  $\alpha_1 < \alpha_2$   
 (E) 以上皆非



6. 已知每年有三期銷售資料，且任何連續三期銷售資料均呈現季節循環現象，過去各年銷售資料如下表所示。已知第三年整年之銷售總量預計達到150，且採用Centered Moving Average法求算季節指數，則第三年的第二期預測銷售量為何？(請選擇最接近的答案作答)

年份	第一期	第二期	第三期
1	20	50	40
2	30	56	45

(A) 58 (B) 60 (C) 63 (D) 65 (E) 68

7. (複選題) 續第6題的說明及數據資料，下列敘述何者正確？

- (A) 平均季節指數應有7個  
 (B) 平均季節指數應有5個  
 (C) 合理的平均季節指數總合應為5.0  
 (D) 合理的平均季節指數總合應為3.0  
 (E) 若平均季節指數之中有一個小於1.0，則其他的平均季節指數之中必至少有一個大於1.0

8. (複選題) 某公司預計採用運輸模型(Transportation Model)完成三期的整合規劃(Aggregate Planning)。基本資料收集如下：生產成本為每個15元，存貨成本為每個每期2元，延期交貨罰金為每期每個6元。第一期期初存貨有0個，第三期期末存貨需0個。第一期至第三期的產能(最高)依序分別為：100個、120個、100個。第一期至第三期的需求量依序分別為：80個、140個、80個。下列敘述何者正確？

		Demand			Total
		1	2	3	
Supply	1		P	Q	
	2				
	3		M	N	
Total					

- (A) 依整體供需而言，產能供給量不足  
 (B) 上表(Transportation Table)中，單位成本M=17元  
 (C) 上表(Transportation Table)中，單位成本N=21元  
 (D) 上表(Transportation Table)中，單位成本P=21元  
 (E) 上表(Transportation Table)中，單位成本Q=19元

9. (複選題) 某產品期初庫存150，生產批量為100。依照下表的四期資料，以Master Scheduling程序進行分析，並依照Master Scheduling的結果答覆問題。下列敘述何者正確？

	Period			
	1	2	3	4
Forecast	60	60	60	60
Customer Order	70	50	30	10

- (A) 第1期至第4期的ATP總和為60  
 (B) 第1期至第4期的MPS分別為：0, 0, 100, 100  
 (C) 第4期的預計存貨(Projected On-hand)量為0  
 (D) 第1期至第4期中，只有第3期需生產一個批量  
 (E) 上表中的Customer Order及MPS均不改變之下，若只額外收到一張訂單在第4期需出貨70，則可以如期交貨

10. 某速食業者規劃速食餐廳的佈置時，考慮區分為：點餐結帳區、廚房區、用餐區、停車區、兒童遊戲區等五大區域，進行整體的佈置。此種思考模式與下列何種佈置理念最為相似？

- (A) Product Layout (B) Process (Functional) Layout (C) Cellular Layout (D) Fixed Position Layout  
 (E) Rank Positional Layout

11. (複選題) 某生產線依序由五個不同的工作站所組成。下列有關生產線平衡的敘述何者正確？

- (A) 該生產線的瓶頸工作站之作業時間，即為該生產線的Cycle time  
 (B) 五個工作站中作業時間最短的工作站，即稱為瓶頸工作站  
 (C) 若五個工作站的作業時間均相同，則各工作站均沒有閒置時間(Idle Time)  
 (D) 若不是瓶頸工作站，則必定有閒置時間(Idle Time)  
 (E) 生產線的平衡與不平衡均以工作站的作業時間為衡量的基準



12. 政府部門提出「單一窗口、一次完成服務」的便民措施。以此觀念所完成的辦公室佈置，其佈置類型與下列何者最為相似？

- (A) Product Layout (B) Process (Functional) Layout (C) Group Layout (D) Fixed Position Layout  
 (E) Mixed Product Layout

13-16 題：某書報攤統計過去 40 天的報紙日需求量，如下表。報紙每份售價 15 元，進貨成本每份 8 元。若當天無法售出則必需以廢紙賣出，每份僅得 2 元。試回答下列問題：

需求量	20	30	40	50	60	70	80
天數	2	5	8	10	8	5	2

13. 若以滿足服務水準為前提，則下列敘述何者不正確？

- (A) 該書報攤之最佳進貨量為 50 (B) 在最佳的報紙進貨量下，其存貨服務水準至少應達到 0.5385 (C) 在最佳的報紙進貨量下，其存貨服務水準至少應達到 0.4615 (D) 若報紙每天的進貨量為 60 份，則存貨服務水準為 0.825

14. 若以滿足利潤最大化為前提，則該書報攤每日應進若干份報紙？

- (A) 20 (B) 40 (C) 50 (D) 60

15. 若以滿足利潤最大化為前提，則下列敘述何者不正確？

- (A) 若每日報紙進貨量為 30，則其期望利潤為 203.5 (B) 若每日報紙進貨量為 40，則其期望利潤為 263.35 (C) 若每日報紙進貨量為 50，則其期望利潤為 272 (D) 若每日報紙進貨量為 60，則其期望利潤為 252.75

16. 在滿足利潤最大化為前提考量下，若報紙無法於當日售出，則沒有剩餘價值。則若進 60 份報紙，其期望利潤應為若干？

- (A) 236.25 (B) 220 (C) 245.18 (D) 260.75

17-20 題：有一飲料公司生產 5 種飲料，該 5 種飲料皆使用同一設備進行生產，且其資料如下表所示。若該公司現有 1700 分鐘可供使用。請試回答下列有關 5 項產品生產狀態之問題。

產品編號	存貨量	生產時間	預測數量/週
A	80	2.0	160
B	100	1.8	250
C	65	3.0	175
D	88	1.5	300
E	120	2.2	200

17. 耗竭時間(run out of time) 為若干？

- (A) 0.3150 (B) 0.2041 (C) 0.2562 (D) 0.2445

18. 產品 D 所需生產之數量為何(採四捨五入)？

- (A) 103 (B) 205 (C) 166 (D) 273

19. 該 5 項產品之生產順序為何？

- (A) E-B-C-D-A (B) C-D-B-E-A (C) D-C-B-A-E (D) B-C-A-D-E

20. 產品 C 之生產時間為若干(採四捨五入)？

- (A) 225 (B) 362 (C) 437 (D) 266



21-23 題：五項工作三部機器（每件工作經過機器之順序均為 M#1, M#2, M#3）之排程資料如下表，若求解目標為平均流程時間最小化，請回答下列問題。

工 作	A	B	C	D	E
時 M#1	8	6	4	9	5
M#2	3	4	2	1	3
間 M#3	2	5	6	6	9

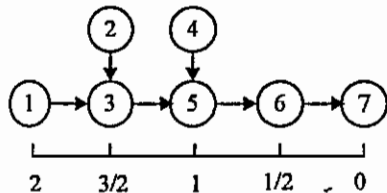
21. 該問題之平均流程時間為若干？  
(A) 25.6 (B) 26.2 (C) 25.4 (D) 25.8
22. 工作 D 在 M#3 上之開始時間為何？  
(A) 21 (B) 26 (C) 25 (D) 35
23. M#2 之閒置時間 (idle time) 為何？  
(A) 23 (B) 22 (C) 21 (D) 20

24-25 題：產品甲於一特定之機器上生產，其 MPS、生產流程圖、及實際每月生產數量表如下所示。請以生產平衡線(balance of line)技巧回答下列問題。

產品甲之 MPS (96 年前半年)：

月份	1	2	3	4	5	6
數量	200	200	400	400	600	600

產品甲之生產流程圖（共分成 7 步驟，時間單位以週表示）：



產品甲各步驟之實際生產累計數量（現在時間 4 月 30 日）：

步驟	1	2	3	4	5	6	7
數量	2400	2050	2200	1850	1750	1650	1200

24. 下列有關產品甲生產進度之敘述，何者不正確？  
(A) 步驟 6 之生產進度超前 150 單位 (B) 步驟 5 之生產進度落後 50 單位 (C) 步驟 4 之生產進度超前 50 單位  
(D) 步驟 3 之生產進度落後 100 單位
25. 下列有關生產步驟 2 之敘述，何者正確？  
(A) 生產進度超前 50 單位 (B) 生產進度落後 50 單位 (C) 生產進度超前 100 單位 (D) 生產進度落後 100 單位



## 1. 請說明以下名詞或概念(24%)

- (1) Computer variable
- (2) Class and Object
- (3) Encapsulation
- (4) Multithreading
- (5) ODBC
- (6) SQL
- (7) Linked list
- (8) Web 2.0

## 2. 類別(Class)設計(26%)

「複數」(Complex)具有實數與虛數兩部分，以  $\text{realPart} + \text{imaginaryPart} * i$  表示，此處  $i = \sqrt{-1}$ 。請以任何物件導向程式語言設計「複數」類別，包括其「屬性」(attribute)及下列成員函數(Member function)或方法(Method)，成員函數或方法應有完整的回傳結果型態、參數型態、與處理程式：

- (1)  $\text{add}(\text{cobj})$ ：令該複數物件加上複數物件  $\text{cobj}$ ，產生一新複數(和)並傳回。
- (2)  $\text{subtract}(\text{cobj})$ ：令該複數減去複數物件  $\text{cobj}$ ，產生一新複數(差)並傳回。
- (3)  $\text{multiply}(\text{cobj})$ ：令該複數乘上複數物件  $\text{cobj}$ ，產生一新複數(積)並傳回。
- (4)  $\text{divide}(\text{cobj})$ ：令該複數除以複數物件  $\text{cobj}$ ，產生一新複數並傳回。
- (5)  $\text{print}()$ ：以  $a+bi$  文字格式在標準輸出裝置顯示該複數。

[Note :  $i^2 = -1$ ]

3. 請說明 P2P(Peer to Peer, 點對點技術)的運作方式，以及請討論對相關產業/領域所帶來的影響/衝擊/問題。(15%)
4. 請討論 Web 2.0 對相關產業/領域所帶來的影響/衝擊/問題(註：可省略此題名詞解釋的部分)。(20%)
5. 請說明 Wikipedia (維基百科) 對相關產業/領域所帶來的影響/衝擊/問題。(15%)





1. 求  $\lim_{x \rightarrow 0} (5x + e^x)^{\frac{1}{x}}$  之極限
2. 求  $\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{(n+i)^k}{n^{k+1}}$  之極限
3. 求  $\int e^{2x} \sin 3x \, dx$  之值
4. 求  $\int_0^1 \frac{xe^x}{(x+1)^2} dx$  之積分
5. 求  $\int_0^\pi \frac{x \sin x}{a + b \cos^2 x} dx$   $a, b > 0$  之積分
6. 設  $f(x) = x^2 - 2x - 3$ , 求  $f(x)$  在  $[-2, 4]$  區間與  $x$  軸所圍成之面積
7. 設  $f(x) = e^x$ , 求  $f(x)$  對  $x=0$  及  $x=3$  之泰勒展開式
8. 設  $f(x) = \int_0^x e^{2t} \sin t \, dt$ , 求  $f(x)$  在  $0 \leq x \leq \pi$  之極值
9. 求  $\sum_{n=1}^{\infty} \frac{n(x-1)^n}{2^n(3n-1)}$  的收斂區間
10. 設  $x = \tan^2(y^2 + a)$ , 求  $\frac{dy}{dx}$

(每題 10 分)



本份試卷共 50 題單選題，每題 2 分

1. In response to news reports that taking aspirin daily can reduce an individual's risk of a heart attack, there will most likely be a(n)
  - A. increase in the supply of aspirins.
  - B. decrease in the supply of aspirins.
  - C. increase in the demand for aspirins.
  - D. increase in the quantity demanded of aspirins.
  
2. Consumer surplus will be zero at any quantity if
  - A. supply is perfectly elastic.
  - B. supply is perfectly inelastic.
  - C. demand is perfectly elastic.
  - D. demand is perfectly inelastic.
  
3. A firm is currently producing in the inelastic portion of its demand curve. What course of action should you recommend to this firm?
  - A. Continue producing at the current output level, because the firm will maximize its total revenue by producing in the inelastic portion of its demand curve.
  - B. Reduce price, because if demand is inelastic and price is reduced, total revenue will increase.
  - C. Increase price, because if demand is inelastic and price is increased, total revenue will increase.
  - D. Continue selling at the same price, but increase the number of units it produces.
  
4. The government is considering placing a tax on cigarettes to raise revenue to finance health care benefits. One of the arguments for this tax is that the demand for cigarettes is price inelastic. Which of the following statements is TRUE?
  - A. The tax on cigarettes may not raise as much revenue as anticipated in the years to come because the demand for cigarettes is likely to become more elastic over time.
  - B. This is a very good way to raise revenue both in the short term and in the long term because there are no substitutes for cigarettes.



- C. This tax will not raise much revenue either in the short term or the long term because demand is price inelastic.
- D. No tax revenue can be raised in this way because sellers of cigarettes will just lower their price by the amount of the tax and therefore the price of cigarettes to consumers will not change.
5. For Tom, the marginal utility of the first cup of coffee he drinks in the morning is worth \$2.00. The marginal utility of the 9th cup of coffee he drinks is positive and the marginal utility of the 10th cup of coffee he drinks in the morning is worth \$0. This implies that at a price of \$0, Tom
- A. would drink an infinite number of cups of coffee each morning.
- B. would drink at least 10 cups of coffee per morning.
- C. would drink more than 10 cups of coffee per morning, but the actual number is indeterminate from this information.
- D. would drink zero cups of coffee per morning.
6. Assuming that charitable giving is a normal good, the income effect of a decrease in personal tax rates should
- A. lead to less giving because giving to charity would become more expensive relative to other goods.
- B. lead to more giving because giving to charity would become less expensive relative to other goods.
- C. lead to more giving because households would have more disposable income.
- D. lead to less giving because households would spend that money on luxury goods.
7. If the substitution effect of a wage change outweighs the income effect of a wage change, the labor-supply curve is
- A. upward sloping.
- B. horizontal.
- C. vertical.
- D. backward bending.



8. Jerry sells cherry sno-cones along the boardwalk in New Jersey. During the summer this is a perfectly competitive business, and Jerry faces a perfectly elastic demand curve. If he wants to try to increase revenues he should
- A. raise the price of his sno-cones to make more per sale.
  - B. lower the price of his sno-cones to try to sell more.
  - C. keep the price the same but produce more to increase sales.
  - D. do nothing; there is nothing he can do to increase revenue.
9. If the marginal product of labor equals the average product of labor, then the
- A. average product is maximized.
  - B. marginal product is maximized.
  - C. marginal product is still increasing.
  - D. average product is still increasing.
10. You own a building that has four possible uses: a cafe, a craft store, a hardware store, and a bookstore. The value of the building in each use is \$2,000; \$3,000; \$4,000; and \$5,000, respectively. You decide to open a hardware store. The opportunity cost of using this building for a hardware store is
- A. \$2,000, the value if the building is used as a cafe.
  - B. \$3,000, the value if the building is used as a craft store.
  - C. \$10,000, the sum of the values if the building is used for a cafe, a craft store, or a bookstore.
  - D. \$5,000, the value if the building is used for a bookstore.
11. The total cost curve for a firm can be derived from isoquants and isocost lines by
- A. varying the prices of capital and labor and keeping total expenditure constant.
  - B. varying production technologies, but keeping input prices and expenditure levels constant.
  - C. varying total expenditures while keeping input prices and production technology constant.
  - D. varying the price of either capital or labor while keeping total expenditures and production technology constant.



12. If a firm's demand curve is perfectly elastic, then at the profit maximizing level of output
- A.  $P = MR = MC$ .
  - B.  $P > MR > MC$ .
  - C.  $P < MR < MC$ .
  - D.  $P > 0$  and  $MR = 0$ .
13. A firm suffers operating losses if
- A. price exceeds average variable cost but is less than average total cost.
  - B. price exceeds marginal cost.
  - C. revenues are smaller than variable costs of production.
  - D. revenues are greater than variable costs of production but less than total costs.
14. If a firm is incurring an operating loss, in the short run the firm should \_\_\_\_\_ and in the long run the firm should \_\_\_\_\_.
- A. produce where  $MC = MR$ ; exit the industry
  - B. shut down; exit the industry
  - C. produce where  $MC = MR$ ; expand
  - D. shut down; expand
15. Engineers for The All-Terrain Bike Company have determined that a 15% increase in all inputs will cause a 15% increase in output. Assuming that input prices remain constant, you correctly deduce that such a change will cause \_\_\_\_\_ as output increases.
- A. average costs to increase
  - B. average costs to decrease
  - C. average costs to remain constant
  - D. marginal costs to increase
16. Assume the peanut industry, a perfectly competitive industry, is in long-run equilibrium with a market price of \$5. If demand for peanuts increases and this industry is a decreasing-cost industry, long-run equilibrium will be reestablished at a price
- A. greater than \$5.
  - B. less than \$5.



- C. equal to \$5.  
D. either greater than or less than \$5, depending on the number of firms that enter the industry.
17. Assuming labor is the only variable factor of production, production of a good will occur
- A. as long as the marginal revenue product of labor is positive.
  - B. if society values a good more than it costs firms to hire the workers to produce the good.
  - C. as long as the product's price is greater than the marginal revenue product of labor.
  - D. if the marginal cost of a unit of output equals the marginal revenue product of labor.
18. Because petroleum is fixed in supply, its price is
- A. demand determined.
  - B. supply determined.
  - C. inelastic.
  - D. independently determined.
19. The number of seats available in a stadium is fixed at 80,000. The equilibrium price for a ticket to a football game at the stadium is \$30. The equilibrium price for a ticket to a soccer match at the stadium is \$10. Which of the following is TRUE?
- A. Football games must be more expensive to produce than a soccer match.
  - B. The demand for each football game must be more than the demand for each soccer match.
  - C. The supply of soccer matches must be less elastic than the supply of football games.
  - D. The demand for each soccer game must be greater than the demand for each football game.
20. Joe and Carl are both reporters and they both have the same productivity. They each can write five articles a week. Joe writes articles about celebrities. Carl writes articles about economics. Joe earns twice as much as Carl. Which of the following could explain this?



- A. There are more reporters writing about celebrities than there are reporters writing about economics.
- B. The output effect is greater for celebrity writers than economics writers.
- C. There must be more substitutes available for economics writers than there are for celebrity writers.
- D. People are willing to pay more for stories about celebrities than for stories about economics.
21. When market interest rates \_\_\_\_\_, \_\_\_\_\_ investment projects are undertaken.
- A. decrease; more
- B. increase; more
- C. decrease; less
- D. increase; no
22. Monopolistic competition differs from perfect competition primarily because in
- A. monopolistic competition, firms can differentiate their products.
- B. perfect competition, firms can differentiate their products.
- C. monopolistic competition, entry into the industry is blocked.
- D. monopolistic competition, there are relatively few barriers to entry.
23. An oligopoly with a dominant price leader will produce an output level that is \_\_\_\_\_ than the output level that would prevail if the industry were a monopoly and sells it at a price that is \_\_\_\_\_ than the price that would prevail if the industry were a monopoly.
- A. higher; higher
- B. higher; lower
- C. lower; lower
- D. lower; higher
24. You want to purchase a new car. You have gone to 3 dealerships that sell the type of car you want. The price of the car is different at each of the dealerships. You have estimated that if you go to another dealership, the marginal amount you may save will be \$250, but the marginal cost of going to the dealership would be \$350. Which of the following statements is accurate?



- A. You should go to the next dealership, as you would be able to save an additional \$250.
- B. In order to determine whether or not you should go to the next dealership, you would need to know the total costs and total benefits of this action.
- C. You should not go to the next dealership because the marginal cost of this action exceeds the marginal benefit.
- D. You should continue going to dealerships as long as the marginal benefit of additional search is positive.
25. If the payroll tax for Social Security in the United States were levied on all wage and salary income instead of just the first \$87,000 of wage and salary income, the payroll tax would be
- A. regressive.
- B. progressive.
- C. proportional.
- D. an ability-to-pay tax.
26. Assume that apples cost \$0.50 in 2002 and \$1 in 2007, whereas oranges cost \$1 in 2002 and \$1.50 in 2007. If 4 apples were produced in 2002 and 5 in 2007, whereas 3 oranges were produced in 2002 and 5 in 2007, then the GDP deflator in 2007, using a base year of 2002, was approximately:
- A. 1.5
- B. 1.7
- C. 1.9
- D. 2.0
27. If there are 100 transactions in a year and the average value of each transaction is \$10, then if there is \$200 of money in the economy, transactions velocity is \_\_\_\_\_ times per year:
- A. 0.2
- B. 2
- C. 5
- D. 10





28. If income velocity is assumed to be constant, but no other assumptions are made, the level of \_\_\_ is determined by the quantity of money.
- A. prices
  - B. income
  - C. transactions
  - D. nominal GDP
29. The percentage change in the price level is approximately equal to the percentage change in:
- A. the quantity of money.
  - B. the quantity of money minus the percentage change in real output.
  - C. the quantity of money minus the percentage change in real output plus the percentage change in the transactions velocity of money.
  - D. the quantity of money minus the percentage change in real output minus the percentage change in the transactions velocity of money.
30. If the nominal exchange rate falls by 10 percent, the domestic price level rises by 4 percent, and the foreign price level rises by 6 percent, the real exchange rate will fall by:
- A. 0 percent
  - B. 8 percent
  - C. 10 percent
  - D. 12 percent
31. In a small open economy, if the introduction of automatic-teller machines reduces the demand for money, then net exports:
- A. fall and the real exchange rate falls.
  - B. fall but the real exchange rate remains unchanged.
  - C. remain unchanged but the real exchange rate falls.
  - D. and the real exchange rate remain unchanged.
32. Assume that some large foreign countries begin to subsidize investment by instituting an investment tax credit. Then, if world saving does not depend on the interest rate, world investment:
- A. will rise and home country investment will fall.
  - B. will rise and home country investment will remain unchanged.
  - C. will remain unchanged and home country investment will fall.
  - D. and home country investment will both remain unchanged.



33. Assume that a war breaks out abroad, and foreign investors choose to invest more in a large safe country, the United States. Then, the U.S. real interest rate:
- and net exports will both fall.
  - will fall and net exports will rise.
  - will rise and net exports will fall.
  - and net exports will both rise.
34. If the rate of separation is 0.02 and the rate of job finding is 0.08 but the current unemployment rate is 0.10, then the current unemployment rate is \_\_\_\_\_ the equilibrium rate, and in the next period it will move \_\_\_\_\_ the equilibrium rate.
- above; toward
  - above; away from
  - below; toward
  - below; away from
35. Assume that a country experience a reduction in productivity that shifts the labor demand curve downward and to the left. If the labor market were always in equilibrium, this would lead to:
- a lower real wage and a rise in unemployment.
  - a lower real wage and no change in unemployment.
  - a lower real wage and less unemployment.
  - no change in real wage or in unemployment.
36. If the per-worker production function is given by  $y = k^{1/2}$ , where  $y$  is output per worker, and  $k$  is capital per worker, the saving rate is 0.2, and the depreciation rate is 0.1, then the steady-state ratio of capital to labor is:
- 1
  - 4
  - 2
  - 9
37. Assume that a war reduces a country's labor force but does not directly affect its capital stock. If the economy was in a steady state before the war and the saving rate does not change after the war, then, over time, capital per worker will \_\_\_\_\_ and output per worker will grow \_\_\_\_\_ than it did before the war.



- A. decline; faster  
B. decline; more slowly  
C. increase; faster  
D. increase; more slowly
38. If the U.S. production function is Cobb-Douglas with capital share 0.3, output growth is 3 percent per year, depreciation is 4 percent per year, and the Golden Rule steady-state capital-output ratio is 4.29, to reach the Golden Rule steady state, the saving rate must be:  
A. 17.5 percent  
B. 25 percent  
C. 30 percent  
D. 42.9 percent
39. If the marginal product of capital net of depreciation equals 8 percent, the rate of growth of population equals 2 percent, and the rate of labor-augmenting technical progress equals 2 percent, to reach the Golden Rule level of the capital stock the \_\_\_\_\_ rate in this economy must be \_\_\_\_\_:  
A. saving; increased  
B. population growth; decreased  
C. depreciation; decreased  
D. total output growth; decreased
40. If the production function is  $Y = A \cdot K^{2/3} \cdot L^{1/3}$  in the land of Solovia, where A is a parameter measuring the productivity of technology, K denotes the amount of capital, and L denotes the amount of labor, and the labor force increases by 5 percent while capital is constant, labor productivity will:  
A. increase by 3.33 percent.  
B. increase by 1.67 percent.  
C. decrease by 1.67 percent.  
D. decrease by 3.33 percent.
41. The rate of growth of labor productivity (Y/L) may be expressed as the rate of growth of total factor productivity:  
A. plus the capital share multiplied by the rate of growth of the capital-labor ratio.



- B. minus the capital share multiplied by the rate of growth of the capital-labor ratio.
- C. plus the rate of growth of capital productivity.
- D. minus the rate of growth of capital productivity.
42. If the demand for money increases, but the central bank keeps the money supply the same, then in the short run output will:
- A. fall and in the long run prices will remain unchanged.
- B. remain unchanged and in the long run prices will fall.
- C. remain unchanged and in the long run prices will remain unchanged.
- D. fall and in the long run prices will fall.
43. If the central bank reduces the money supply by 5 percent, then the real interest rate will:
- A. rise both in the short run and the long run.
- B. rise in the short run but return to its original equilibrium level in the long run.
- C. rise in the short run but will fall below its original equilibrium level in the long run.
- D. be unaffected both in the short run and the long run.
44. If central bank A cares only about keeping the price level stable and central bank B cares only about keeping output at its natural level, then in response to an exogenous increase in the price of oil:
- A. both central bank A and central bank B should increase the quantity of money.
- B. central bank A should increase the quantity of money whereas central bank B should keep it stable.
- C. central bank A should keep the quantity of money stable whereas central bank B should increase it.
- D. both central bank A and central bank B should keep the quantity of money stable.
45. Consider the impact of an increase in thriftiness in the Keynesian-cross analysis. Assume that the marginal propensity to consume is unchanged, but the intercept of the consumption function is made smaller so that at every income level saving is greater. This will:



- A. lower equilibrium income by the decrease in the intercept multiplied by the multiplier.
- B. lower equilibrium income by the decrease in the intercept.
- C. raise equilibrium income by the decrease in the intercept.
- D. rise equilibrium income by the decrease in the intercept multiplied by the multiplier.
46. The increase in income in response to a fiscal expansion in the IS-LM is:
- A. always less than in the Keynesian-cross model
- B. less than in the Keynesian-cross model unless the LM curve is vertical
- C. less than in the Keynesian-cross model unless the LM curve is horizontal
- D. less than in the Keynesian-cross model unless the IS curve is vertical
47. In a small, open economy with a floating exchange rate, the exchange rate will depreciate if
- A. taxes are decreased.
- B. import quotas are imposed.
- C. government spending is increased.
- D. the money supply is decreased.
48. If the demand function for money is  $\frac{M}{P} = 0.5 \cdot Y - 100 \cdot r$ , where M stands for the quantity of money, P stands for the price level, Y stands for income, and r stand for interest rate, then the slope of the LM curve is
- A. 0.001
- B. 0.005
- C. 0.01
- D. 0.05
49. If the demand function for money is  $\frac{M}{P} = 0.5 \cdot Y - 100 \cdot r$  and if  $\frac{M}{P}$  increases by 100, then the LM curve for any given interest rate shifts to the:
- A. left by 100.
- B. left by 200.
- C. right by 100.
- D. right by 200.



50. Other things equal, a given change in money supply has a larger effect on demand the:
- A. flatter the IS curve.
  - B. steeper the IS curve.
  - C. smaller the interest sensitivity of expenditure demand.
  - D. smaller the income sensitivity of expenditure demand.