國立雲林科技大學
八十九學年度研究所碩士班入學考試試題

系所：工管所
科目：作業研究

1. (1) (9%) Please describe three major causes which may lead to the failure of an Operations Research study in real world problems.

   (2) (8%) List four assumptions or presumptions a Linear Programming model may have in representing a real world problem.

   (3) (8%) List at least four major steps of an Operations Research study.

2. A cooking oil manufacturing company produces 3 kinds of oil: oil A, oil B and oil C from 4 different kinds of seeds: seed 1, seed 2 , seed 3 and seed 4 which are supplied by a single seeds supplier based on yearly contract. The following provides the basic data of the problem

	tons of seeds per ton of			amounts of seeds delivered
	oil A	oil B	oil C	daily from the supplier (tons)
seed 1	2	3	5	4000
seed 2	4	2	7	6000
seed 3	1	4	5	3600
seed 4	1	5	2	3000
profit per ton($1000)	5	8	12	

   The optimal daily quantities produced for oils A, B and C are 920, 320, and 240 , respectively. As the oil company and the seeds supplier is planning to sign a new contract for the next year. Assuming that the profits for different kinds of oil remains the same. Based on the current optimal solution, shall the oil company increase or decrease the daily supply of seed i , $i = 1, 2, 3, 4$, from seeds supplier? Why? (Score is granted only if you provide the reasoning of increase or decrease of the supply quantity.) (25%)

3. A service station has one gasoline pump. Cars wanting gasoline arrive according to a Poisson process at a mean rate of **12** per hour. However, if the pump already is being used, these potential customers may balk (drive on to another service station). In particular, if there are n cars already at the service station, the probability that an arriving potential customer will balk is **n/4** for n= **1,2,3,4**. The time required to serve a car has an exponential distribution with a mean of **5** minutes.
   (a) Construct the rate diagram for this queueing system. (5%)
   (b) Develop the balance equations. (5%)
   (c) Solve these equations to find the steady-state probability distribution of the number of cars at the station. Verify that this solution is the same as that given by the general solution for the birth-and-death process. (10%)
   (d) Find the expected waiting time (including service) for those cars that stay. (5%)

4. A company must supply 30 units of its new products in the next quarter, then 25,10 and 35 units in the successive quarters. Each quarter in which the company produces requires a set up cost of $100 plus $3 per unit produced. There is no limit on the production capacity. Unit can be held in inventory at a cost of $5 per unit per quarter. The company seeks a minimum total cost production plan. Formulate this problem a shortest path problem by drawing the appropriate network and then solve it to find the minimum total cost production plan. (25%)

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b. 175
c. 240
d. 690
e. 850

8. PERT is different from CPM because
a. it does not assume independence among the activities
b. it does not assume precise breaking point between activities
c. it does not focus too much attention on activities on the critical path
d. it does not assume certainty in activity durations
e. it assumes activity duration are not crashable

II. Problems (60%)

1. A computer manufacturing company use a component purchased from a distance supplier. The owner believes the assumptions of the EOQ model are meet reasonably well. Minimization of inventory costs is his objective. Given the following data:

Annual demand = 2400 units
Ordering cost = $ 12 per order
Holding cost = $4 per unit per year

a. How many times per year will the company replenish its inventory of this material?(7%)
b. If the company owner insisted upon ordering his component once per calendar quarter, how much more expensive is this decision over an EOQ decision?(7%)
c. If the company owner discovered that the carrying cost had been overestimated, and was in reality only $1 per unit per year, what is the corrected value of the EOQ?(6%)

2. A project has the following list of activities necessary to be completed. Times are given in weeks.

Activity	Preceding Activity	Optimistic Time	Most Likely Time	Pessimistic Time
A		7	9	14
B	A	2	2	8
C	A	8	12	16
D	A	4	5	10
E	B	3	6	8
F	B	6	8	10
G	C, F	2	3	4
H	D	2	2	6
I	H	6	8	16
J	G, I	4	6	12
K	E, J	2	2	3

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a. How long is the estimated time of the critical path?(7%)
b. What is the probability of completion of the project before week 30?(7%)
c. What is the probability of completion of the project after week 40?(6%)

3. Each week the manager of a company needs to schedule a cutting machine for the orders for the week. Assume this week the manager has the following orders for the cutting machine.

ORDER	MACHINE TIME	DUEDATE (FROM NOW)
1	1	7
2	2	3
3	4	2
4	6	12
5	3	20
6	5	16

(1) Try to find a schedule which minimize Average Number of Jobs at Work Center ? (5%)
(2) Try to find a schedule which minimize Average Completion Time ? (5%)
(3) Try to find a schedule which minimize Maximum Tardiness ? (5%)
(4) Use Hodgson Heuristic to develop a schedule which minimize Number of Tardy Job (N_T).(5%)

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共有10題，每題10分，共計100分。

I.

1. 試問是否有任何 k 值可使

$$f(x)=\begin{cases}\dfrac{\sin x}{2x} & x\neq 0\\ k & x=0\end{cases}$$

在 $x=0$ 處連續？

2. 試求出 $f(x)=\sin(2x)-2\sin x$ 的反曲點 (inflection point)。

3. 有一半圓球形盛水容器，其半徑為 r。當水深為 $\frac{1}{2}r$ 時，試問所注入的水量為該容器總容積的百分之幾？

4. 試求出由 $r=2\cos\theta$ 圓內與 $r=1$ 圓外所圍成區域的面積。

5. 計算 $\sum_{k=1}^{5}\frac{k^3}{225}+\left(\sum_{k=1}^{5}k\right)^3$

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II.

6. 試求平面 $2x-2y+z=0$ 的 orthonormal base.

7. 若 $M=\begin{pmatrix} 0.65 & 0.35 \\ 0.5 & 0.5 \end{pmatrix}$，試求其穩定狀態解 (steady-state)

8. 若 $y_j = a+bx_j$, $j=1\cdots n$，試以最小平方法 (least square method)，求其 normal equation.

9. $A=(a_{ij})_{n\times n}$.
   a) 試定義 A 的 adjoint matrix ($\operatorname{adj} A$).
   b) 若 A 為一可逆方陣，試証 $\operatorname{adj}(A^{-1}) = (\operatorname{adj} A)^{-1}$.

10. 若 $B=\begin{pmatrix} 1 & 1 & 4 & 1 & 2 \\ 0 & 1 & 2 & 1 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & -1 & 0 & 0 & 2 \end{pmatrix}$，
    試求其秩 (rank) 與核維 (nullity).

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1. (10%) An assembler of electric fans uses motors from two sources. Company A supplies 90% of the motors and company B supplies the other 10%. Suppose it is known that 5% of the motors from company A are defective and 3% of the motors from company B are defective. Two assembled fans are inspected and found to have defective motors. What is the probability that the two defective motors was supplied by Company A?

2. (10%) The lifetime, X, of a certain electric company is a random variable with density function $f(x) = (1/100)e^{-x/100}$, for $x > 0$. Three of these components operate independently in a piece of equipment. The equipment fails if at least two of the components fail. Find the probability that the equipment operates for at least 200 hours without failure.

3. (10%) (a) If X has a Poisson distribution so that $3P(X=1) = P(X=2)$, find $P(X=4)$.
   (b) Suppose that the mean of a Poisson random variable Y is $\mu = 9$. Compute $P(\mu - 2\sigma < Y < \mu + 2\sigma)$.

4. (10%) (a) Let Y have a uniform distribution $U(0, 1)$, and let $W = a + (b-a)Y$, for $a<b$. Find the density function of W.
   (b) Let X have an exponential distribution with mean $1/\lambda$, and let $V = 1 - e^{-\lambda X}$. Find the density function of V.

5. (10%) Let $X_1, X_2, \ldots, X_{48}$ be a random sample of size 48 from the distribution with density function $f(x) = 1/x^2$, $1 < x < \infty$. Approximate the probability that at most 10 of these random variables have values greater than 4.

6. A consumer wants to compare the data transfer speed of two ISP (Internet Information Server): A and B. Twenty sites of network computers are randomly assigned to two groups: one is connected to company A and the other is connected to company B. The 20 computers download a HTML document from a URL at the same time. The following are the time (in seconds) required to download the document:

ISP A:	3.2	5.2	3.2	3.6	2.1	3.6	5.0	3.9	3.3	4.9
ISP B:	4.7	5.2	4.4	3.8	5.2	3.1	4.3	4.7	3.7	4.0

(a) (4%) Is there any difference between the variances of data transfer time of the two ISP at 0.1 significance level?

(b) (4%) What assumption do you need in the hypothesis testing of (a)?

(c) (4%) Is there any difference between the average data transfer time of the two ISP at 0.1 significance level? What is the p value?

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7. A hundred products were randomly investigated from an assembly line. Two of them were found to be defective.

(a) (6%) Construct an appropriate 95% *one-sided* confidence limit for the mean defect percent to answer whether it is lower than 0.03. What is your conclusion?

(b) (6%) Suppose we want to construct a 95% *two-sided* confidence interval for the mean defect percent and control the halfwidth to be 0.02. How large is a sample required?

8. (12%) The following data is a random sample from a certain population:

17.5	7.0	21.9	3.6	3.2	10.9	24.9	5.6	12.9	24.7
5.3	7.2	9.4	7.7	3.5	3.2	0.7	0.8	0.2	0.2

Use a goodness-of-fit test to test if the data is normally distributed at 0.05 significance level.

9. Heat treating is often used to carburize (碳化) metal parts such as gears. A lab test is performed on the soaktime (heat treating time) against the carburized layer thickness of gears. Let predictor X be the soaktime and response Y be the carburized layer thickness (unit: pitch). The following are the summarized results:

$$n=19,$$

$$\bar{X}=1.25, \bar{Y}=1.963, S_{XX}=\sum_{i=1}^{n}(X_i-\bar{X})^2=6.125, S_{YY}=\sum_{i=1}^{n}(Y_i-\bar{Y})^2=3.324,$$

$$\text{and } S_{XY}=\sum_{i=1}^{n}(X_i-\bar{X})(Y_i-\bar{Y})=3.958$$

(a) (4%) Determine the linear regression function between soaktime and carburized layer thickness.

(b) (6%) Prepare an ANOVA table.

(c) (4%) Test if the regression function is linear at 0.05 significance level.

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附表P1

Table A.4 Critical Values of the t-Distribution

	α						
ν	0.40	0.30	0.20	0.15	0.10	0.05	0.025
1	0.325	0.727	1.376	1.963	3.078	6.314	12.706
2	0.289	0.617	1.061	1.386	1.886	2.920	4.303
3	0.277	0.584	0.978	1.250	1.638	2.353	3.182
4	0.271	0.569	0.941	1.190	1.533	2.132	2.776
5	0.267	0.559	0.920	1.156	1.476	2.015	2.571
6	0.265	0.553	0.906	1.134	1.440	1.943	2.447
7	0.263	0.549	0.896	1.119	1.415	1.895	2.365
8	0.262	0.546	0.889	1.108	1.397	1.860	2.306
9	0.261	0.543	0.883	1.100	1.383	1.833	2.262
10	0.260	0.542	0.879	1.093	1.372	1.812	2.228
11	0.260	0.540	0.876	1.088	1.363	1.796	2.201
12	0.259	0.539	0.873	1.083	1.356	1.782	2.179
13	0.259	0.537	0.870	1.079	1.350	1.771	2.160
14	0.258	0.537	0.868	1.076	1.345	1.761	2.145
15	0.258	0.536	0.866	1.074	1.341	1.753	2.131
16	0.258	0.535	0.865	1.071	1.337	1.746	2.120
17	0.257	0.534	0.863	1.069	1.333	1.740	2.110
18	0.257	0.534	0.862	1.067	1.330	1.734	2.101
19	0.257	0.533	0.861	1.066	1.328	1.729	2.093
20	0.257	0.533	0.860	1.064	1.325	1.725	2.086
21	0.257	0.532	0.859	1.063	1.323	1.721	2.080
22	0.256	0.532	0.858	1.061	1.321	1.717	2.074
23	0.256	0.532	0.858	1.060	1.319	1.714	2.069
24	0.256	0.531	0.857	1.059	1.318	1.711	2.064
25	0.256	0.531	0.856	1.058	1.316	1.708	2.060
26	0.256	0.531	0.856	1.058	1.315	1.706	2.056
27	0.256	0.531	0.855	1.057	1.314	1.703	2.052
28	0.256	0.530	0.855	1.056	1.313	1.701	2.048
29	0.256	0.530	0.854	1.055	1.311	1.699	2.045
30	0.256	0.530	0.854	1.055	1.310	1.697	2.042
40	0.255	0.529	0.851	1.050	1.303	1.684	2.021
60	0.254	0.527	0.848	1.045	1.296	1.671	2.000
120	0.254	0.526	0.845	1.041	1.289	1.658	1.980
∞	0.253	0.524	0.842	1.036	1.282	1.645	1.960

Teble A.3 (continued) Areas Under the Normal Curve

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.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	0.9278	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

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附表P2

Table A.5 Critical Values of the Chi-Squared Distribution

ν	α = 0.995	0.99	0.98	0.975	0.95	0.90	0.80	0.75	0.75	0.50
1	0.0^4393	0.0^3157	0.0^3628	0.0^3982	0.00393	0.0158	0.0642	0.102	0.148	0.455
2	0.0100	0.0201	0.0404	0.0506	0.103	0.211	0.446	0.575	0.713	1.386
3	0.0717	0.115	0.185	0.216	0.352	0.584	1.005	1.213	1.424	2.366
4	0.207	0.297	0.429	0.484	0.711	1.064	1.649	1.923	2.195	3.357
5	0.412	0.554	0.752	0.831	1.145	1.610	2.343	2.675	3.000	4.351
6	0.676	0.872	1.134	1.237	1.635	2.204	3.070	3.455	3.828	5.348
7	0.989	1.239	1.564	1.690	2.167	2.833	3.822	4.255	4.671	6.346
8	1.344	1.646	2.032	2.180	2.733	3.490	4.594	5.071	5.527	7.344
9	1.735	2.088	2.532	2.700	3.325	4.168	5.380	5.899	6.393	8.343
10	2.156	2.558	3.059	3.247	3.940	4.865	6.179	6.737	7.267	9.342
11	2.603	3.053	3.609	3.816	4.575	5.578	6.989	7.584	8.148	10.341
12	3.074	3.571	4.178	4.404	5.226	6.304	7.807	8.438	9.034	11.340
13	3.565	4.107	4.765	5.009	5.892	7.042	8.634	9.299	9.926	12.340
14	4.075	4.660	5.368	5.629	6.571	7.790	9.467	10.165	10.821	13.339
15	4.601	5.229	5.985	6.262	7.261	8.547	10.307	11.036	11.721	14.339
16	5.142	5.812	6.614	6.908	7.962	9.312	11.152	11.912	12.624	15.338
17	5.697	6.408	7.255	7.564	8.672	10.085	12.002	12.792	13.531	16.338
18	6.265	7.015	7.906	8.231	9.390	10.865	12.857	13.675	14.440	17.338
19	6.844	7.633	8.567	8.907	10.117	11.651	13.716	14.562	15.352	18.338
20	7.434	8.260	9.237	9.591	10.851	12.443	14.578	15.452	16.266	19.337
21	8.034	8.897	9.915	10.283	11.591	13.240	15.445	16.344	17.182	20.337
22	8.643	9.542	10.600	10.982	12.338	14.041	16.314	17.240	18.101	21.337
23	9.260	10.196	11.293	11.688	13.091	14.848	17.187	18.137	19.021	22.337
24	9.886	10.856	11.992	12.401	13.848	15.659	18.062	19.037	19.943	23.337
25	10.520	11.524	12.697	13.120	14.611	16.473	18.940	19.939	20.867	24.337
26	11.160	12.198	13.409	13.844	15.379	17.292	19.820	20.843	21.792	25.336
27	11.808	12.879	14.125	14.573	16.151	18.114	20.703	21.749	22.719	26.336
28	12.461	13.565	14.847	15.308	16.928	18.939	21.588	22.657	23.647	27.336
29	13.121	14.256	15.574	16.047	17.708	19.768	22.475	23.567	24.577	28.336
30	13.787	14.953	16.306	16.791	18.493	20.599	23.364	24.478	25.508	29.336

Table A.5 (continued) Critical Values of the Chi-Squared Distribution

ν	α = 0.50	0.25	0.20	0.10	0.05	0.025	0.02	0.01	0.005	0.001
1	0.455	1.323	1.642	2.706	3.841	5.024	5.412	6.635	7.879	10.827
2	1.386	2.773	3.219	4.605	5.991	7.378	7.824	9.210	10.597	13.815
3	2.366	4.108	4.642	6.251	7.815	9.348	9.837	11.345	12.838	16.266
4	3.357	5.385	5.989	7.779	9.488	11.143	11.668	13.277	14.860	18.465
5	4.351	6.626	7.289	9.236	11.070	12.832	13.388	15.086	16.750	20.517
6	5.348	7.841	8.558	10.645	12.592	14.449	15.033	16.812	18.548	22.457
7	6.346	9.037	9.803	12.017	14.067	16.013	16.622	18.475	20.278	24.322
8	7.344	10.219	11.030	13.362	15.507	17.535	18.168	20.090	21.955	26.125
9	8.343	11.389	12.242	14.684	16.919	19.023	19.679	21.666	23.589	27.877
10	9.342	12.549	13.442	15.987	18.307	20.483	21.161	23.209	25.188	29.588
11	10.341	13.701	14.631	17.275	19.675	21.920	22.618	24.725	26.757	31.264
12	11.340	14.845	15.812	18.549	21.026	23.337	24.054	26.217	28.300	32.909
13	12.340	15.984	16.985	19.812	22.362	24.736	25.472	27.688	29.819	34.528
14	13.339	17.117	18.151	21.064	23.685	26.119	26.873	29.141	31.319	36.123
15	14.339	18.245	19.311	22.307	24.996	27.488	28.259	30.578	32.801	37.697
16	15.338	19.369	20.465	23.542	26.296	28.845	29.633	32.000	34.267	39.252
17	16.338	20.489	21.615	24.769	27.587	30.191	30.995	33.409	35.718	40.790
18	17.338	21.605	22.760	25.989	28.869	31.526	32.346	34.805	37.156	42.312
19	18.338	22.718	23.900	27.204	30.144	32.852	33.687	36.191	38.582	43.820
20	19.337	23.828	25.038	28.412	31.410	34.170	35.020	37.566	39.997	45.315
21	20.337	24.935	26.171	29.615	32.671	35.479	36.343	38.932	41.401	46.797
22	21.337	26.039	27.301	30.813	33.924	36.781	37.659	40.289	42.796	48.268
23	22.337	27.141	28.429	32.007	35.172	38.076	38.968	41.638	44.181	49.728
24	23.337	28.241	29.553	33.196	36.415	39.364	40.270	42.980	45.558	51.179
25	24.337	29.339	30.675	34.382	37.652	40.646	41.566	44.314	46.928	52.620
26	25.336	30.434	31.795	35.563	38.885	41.923	42.856	45.642	48.290	54.052
27	26.336	31.528	32.912	36.741	40.113	43.194	44.140	46.963	49.645	55.476
28	27.336	32.620	34.027	37.916	41.337	44.461	45.419	48.278	50.993	56.893
29	28.336	33.711	35.139	39.087	42.557	45.722	46.693	49.588	52.336	58.302
30	29.336	34.800	36.250	40.256	43.773	46.979	47.962	50.892	53.672	59.703

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科目：統計學

附表P4

Table A.6 (continued) Critical Values of the F-Distribution

$f_{0.01}(v_1, v_2)$

v_2	v_1 = 1	2	3	4	5	6	7	8	9
1	4052	4999.5	5403	5625	5764	5859	5928	5981	6022
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56
∞	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41

Table A.6 (continued) Critical Values of the F-Distribution

$f_{0.01}(v_1, v_2)$

v_2	v_1 = 10	12	15	20	24	30	40	60	120	∞
1	6056	6106	6157	6209	6235	6261	6287	6313	6339	6366
2	99.40	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.50
3	27.23	27.05	26.87	26.69	26.60	26.50	26.41	26.32	26.22	26.13
4	14.55	14.37	14.20	14.02	13.93	13.84	13.75	13.65	13.56	13.46
5	10.05	9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02
6	7.87	7.72	7.56	7.40	7.31	7.23	7.14	7.06	6.97	6.88
7	6.62	6.47	6.31	6.16	6.07	5.99	5.91	5.82	5.74	5.65
8	5.81	5.67	5.52	5.36	5.28	5.20	5.12	5.03	4.95	4.86
9	5.26	5.11	4.96	4.81	4.73	4.65	4.57	4.48	4.40	4.31
10	4.85	4.71	4.56	4.41	4.33	4.25	4.17	4.08	4.00	3.91
11	4.54	4.40	4.25	4.10	4.02	3.94	3.86	3.78	3.69	3.60
12	4.30	4.16	4.01	3.86	3.78	3.70	3.62	3.54	3.45	3.36
13	4.10	3.96	3.82	3.66	3.59	3.51	3.43	3.34	3.25	3.17
14	3.94	3.80	3.66	3.51	3.43	3.35	3.27	3.18	3.09	3.00
15	3.80	3.67	3.52	3.37	3.29	3.21	3.13	3.05	2.96	2.87
16	3.69	3.55	3.41	3.26	3.18	3.10	3.02	2.93	2.84	2.75
17	3.59	3.46	3.31	3.16	3.08	3.00	2.92	2.83	2.75	2.65
18	3.51	3.37	3.23	3.08	3.00	2.92	2.84	2.75	2.66	2.57
19	3.43	3.30	3.15	3.00	2.92	2.84	2.76	2.67	2.58	2.49
20	3.37	3.23	3.09	2.94	2.86	2.78	2.69	2.61	2.52	2.42
21	3.31	3.17	3.03	2.88	2.80	2.72	2.64	2.55	2.46	2.36
22	3.26	3.12	2.98	2.83	2.75	2.67	2.58	2.50	2.40	2.31
23	3.21	3.07	2.93	2.78	2.70	2.62	2.54	2.45	2.35	2.26
24	3.17	3.03	2.89	2.74	2.66	2.58	2.49	2.40	2.31	2.21
25	3.13	2.99	2.85	2.70	2.62	2.54	2.45	2.36	2.27	2.17
26	3.09	2.96	2.81	2.66	2.58	2.50	2.42	2.33	2.23	2.13
27	3.06	2.93	2.78	2.63	2.55	2.47	2.38	2.29	2.20	2.10
28	3.03	2.90	2.75	2.60	2.52	2.44	2.35	2.26	2.17	2.06
29	3.00	2.87	2.73	2.57	2.49	2.41	2.33	2.23	2.14	2.03
30	2.98	2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01
40	2.80	2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80
60	2.63	2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60
120	2.47	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38
∞	2.32	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00

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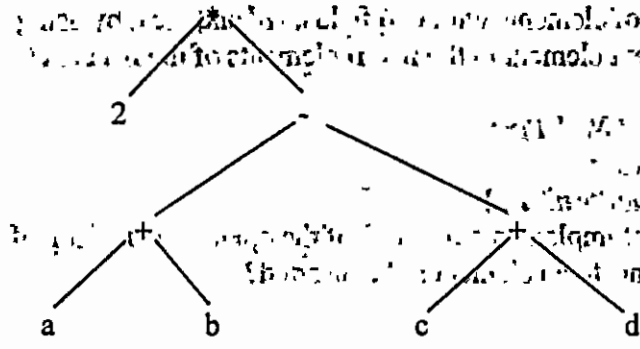
Multiple choice. Choose the one alternative that best completes the statement or answers the question.
(每題2分，答錯不倒扣)

1.



Which of the following arithmetic expressions corresponds directly to the parse tree given by the diagram in the figure above?

(A) $2(a - c)$
(B) $2a - 2c$
(C) $2(a + b) - c + d$
(D) $2((a + b) - (c + d))$
(E) $2(a + b) - 2(c + d)$

2. Which of the following statements must be true?

I. $\lfloor x \rfloor = \lceil x \rceil$ if and only if x is an integer.
II. $\lfloor x \rfloor + 1 = \lceil x \rceil$ if and only if x is not an integer.
III. $\lfloor x \rfloor \lceil y \rceil = \lceil x \rceil \lfloor y \rfloor$ for all x, y.
IV. $-\lfloor x \rfloor = \lceil -x \rceil$ for all x.

(A) IV only (B) I and IV only (C) I, II, and III only
(D) I, II, and IV only (E) I, II, III, and IV

3. Consider a computer system in which processes can request and release one or more resources. Once a process has been granted a resource, the process has exclusive use of that resource until it is released. If a process requests a resource that is already in use, the process enters a queue for that resource, waiting until the resource is available. Which of the following will NOT deal effectively with the problem of deadlock?

(A) Giving priorities to processes and ordering the wait queues by priority
(B) Having a process request all its required resources when it first begins, and restarting if it cannot obtain them all
(C) Numbering the resources and requiring that processes request resources in order of increasing number
(D) Having processes time out and restart after a random interval of waiting
(E) Having the operating system monitor the wait queues and restart processes to break deadlocks

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4. In a language in which operations are associated right-to-left instead of left-to-right (i.e., a + b + c = a + (b + c)), the value of the expression 7 – (16 / (3 + 1) * 2) - 4 is
(A) -1 (B) 1 (C) 3 (D) 7 (E) 9

5. Assume that a list is constructed of elements with two fields, *val* and *next*, by using the *next* field of each element to point to the next element in the list. If elements of the list are characterized in C by

```
typedef struct node *NodePtr ;
struct node {   int val ;
                NodePtr next ; }
```

which of the following is a correct implementation in C of the operation "insert *p* after *q*" where *q* points to a list element and *p* points to an element to be inserted?

(A)
```
q->next = p->next ;
p->next = q ;
```
(B)
```
q->next = p->next ;
p->next = q->next ;
```
(C)
```
q->next = p ;
p->next = q->next ;
```
(D)
```
p->next = q- >next ;
q->next = p ;
```
(E)
```
p->next = q;
q->next = p->next ;
```

6. What does the following C program print?

```
#include <stdio.h>

#define LOW 0
#define HIGH 5
#define CHANGE 2
int reset(int);

int i = LOW;

void main()
{
    auto int i = HIGH;
    reset(i/2);
    reset(i=i/2);
    i = reset(i/2);
    printf("%d\n", i);
}

int reset(int i)
{
    i = i <= CHANGE ? HIGH : LOW;
    return(i);
}
```

(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

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7. What does the following C program print?

```
#include <stdio.h>

int a[] = {0, 1, 2, 3, 4};
int *p[] = {a, a+1, a+2, a+3, a+4};
int **pp = p;

void main()
{
    *++*pp;
    printf("%d\n", **pp);
}
```

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

8. What does the following C program print?

```
#include <stdio.h>

char *c[] = {
    "ENTER",
    "NEW",
    "POINT",
    "FIRST"
};
char **cp[] = {c+3, c+2, c+1, c};
char ***cpp = cp;

void main()
{
    printf("%s\n", **++cpp);
}
```

(A) ER (B) NT (C) ST (D) NEW (E) POINT

9. What does the following C program print?

```
#include <stdio.h>

void main()
{
    static struct S1 {
        char c[4], *s;
    } s1 = {"abc", "def"};
    static struct S2 {
        char *cp;
        struct S1 ss1;
    } s2 = {"ghi", {"jkl", "mno"}};

    printf("%s\n", ++s2.cp);
}
```

(A) ghl (B) jkl (C) mno (D) kl (E) hi

10. What does the following C program print?

```
#include <stdio.h>

struct S1 {
    char *s;
    int i;
    struct S1 *s1p;
};

void main()
{
    static struct S1 a[] = {
        {"abcd", 1, a+1},
        {"efgh", 2, a+2},
        {"ijkl", 3, a}
    };
    struct S1 *p = a;

    printf("%s\n", a[(++p)->i].s);
}
```

(A) abcd (B) efgh (C) ijkl (D) cd (E) gh

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11. What does the following C program print?

```
#include <stdio.h>

struct S1 {
    char *s;
    struct S1 *s1p;
};
void swap(struct S1 *, struct S1 *);

void main()
{
    static struct S1 a[] = {
        {"abcd", a+1},
        {"efgh", a+2},
        {"ijkl", a}
    };
    struct S1 *p[3];
    int i;

    for (i = 0; i<3; i++)
    p[i] = a[i].s1p;
    swap(*p, a);
    printf("%s\n", (*p)->s);
}

void swap(struct S1 *p1, struct S1 *p2)
{
    struct S1 temp;

    temp.s = p1->s;
    p1->s = p2->s;
    p2->s = temp.s;
```

(A) abcd (B) efgh (C) ijkl (D) fgh (E) jkl

12. Suppose we digitize voice at 8000 samples/s, where each sample is 1 byte. How long will it take to fill a 500-byte packet?
(A) 32ms (B) 46.5ms (C) 62.5ms (D) 87ms (E) 112.5ms

13. Which address class is the IP address 135.104.5.2 in?
(A) Class A (B) Class B (C) Class C (D) Class D (E) Class E

14. What is the Hamming distance between "101101" and "011101"?
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

15. What is the rate (Mbps) of a DS3 link?
(A) 8.448 (B) 34.368 (C) 44.736 (D) 139.264 (E) 274.176

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16. A binary signal of rate 500bps is to be transmitted over a communications channel. Assume that only the fundamental frequency of the worst-case sequence is to be received, what is the minimum bandwidth required?
(A) 0-75 Hz (B) 0-145Hz (C) 0-250 Hz (D) 0-325Hz (D) 0-500 Hz

17. Consider an asynchronous data link with one start bit and two stop bits per character and a single start-of-frame and end-of-frame character per message. What is the number of additional bits required to transmit a message comprising one hundred 8-bit characters?
(A) 278 (B) 316 (C) 322 (D) 416 (E) 474

18. A series of 8-bit message blocks is to be transmitted across a data link using a CRC for error detection. A generation polynomial of 11001 is to be used. Which of the following will be transmitted for the message 11100110?
(A) 111001100110 (B) 111001101010 (C) 111001101100
(D) 111001100011 (E) 111001100111

19. Which of the following is NOT a process maturity level defined by the Software Engineering Institute?
(A) initial (B) repeatable (C) defined (D) managed (E) approved

20. Deduction in Prolog is based on the concept of unification. Two expressions E and F are said to be unifiable if there are substitutions for the variables of E and F that make the expressions lexically identical. In the following three expressions, only W, X, Y, and Z are variables.
I. f(W, W)
II. f(X, 1)
III. f(Y, g(Z))
Which of these expressions is (are) pairs of unifiable expressions?
(A) (I, II) only
(B) (I, III) only
(C) (II, III) only
(D) (I, II) and (I, III) only
(E) (I, II), (I, III), and (II, III)

21. A regular expression that denotes all strings of 0's and 1's that have at least two consecutive 1's is
(A) (0+10)*11(10+0)* (B) (0+1)*11(0+1)* (C) (0+1)*10*1(0+1)*
(D) 0*11(0+10)*(0+1)* (E) (0+11)*

22. Assume that a data file has an index consisting of N items, where N is large. If a binary search of the index is used to find an item, then, of the following, which best approximates the mean number of comparisons required to locate a specific index entry?
(A) (N+1)/2 (B) N(N-1)/2 (C) $(\log_2 N)-1$ (D) $N\log_2 N$ (E) $(N+1)/\log_2 N$

23. A relation can be defined by giving the ordered pairs of elements for which the relation holds. If the relation R over {a, b, c} is given by R = {(a, a), (a, b), (b, a), (b, b), (c, c)}, which of the following properties does R have?
I. Symmetry II. Antisymmetry III. Reflexivity IV. Transitivity
(A) None (B) II and III only (C) II and IV only
(D) I, III, and IV (E) II, III, and IV

35. Data management, model management, and dialog management are the major components of this system that a manager can use interactively to retrieve and manipulate relevant data.
(A) Decision reporting system
(B) Management decision system
(C) Decision support system
(D) Management reporting system
(E) Management information system

36. Which of the following is not a true statement?
(A) Two different users might access the same server using completely different client applications with different user interfaces.
(B) In a client/server model, the client might reside on your PC or the host computer.
(C) Working with Internet applications is the same as working with word processors or spreadsheets because of the distributed nature of the Internet and the client/server model used by most Internet applications.
(D) In a client/server model, the server might reside on the same host computer as the client, or another host computer elsewhere on the network.
(E) All of the above statements are true.

37. Which of the following is a true statement?
(A) With object-oriented graphics, when moving and removing parts of pictures it is easier to work with regions rather than objects, especially if those objects overlap.
(B) Object-oriented graphics magnify pixels for fine detail editing and bit-mapped graphics magnify objects.
(C) With bit-mapped graphics the printer's resolution is limited only by the output device.
(D) All of the above statements are true.
(E) None of the above statements are true.

38. PC waveform audio recordings often lack the crystal-clear fidelity of compact disk recordings due to differences in the
(A) hardware medium rate.
(B) waveform rate.
(C) sampling rate.
(D) digitizing rate.
(E) signaling rate.

39. These fonts are stored in the printer's ROM and are always available for use with that printer.
(A) scalable outline fonts
(B) screen fonts
(C) printer fonts
(D) soft fonts
(E) bit-mapped fonts

40. Which of the following is not a WIMP advantage?
(A) they are forgiving
(B) they use a command-line interface
(C) they are protective
(D) they are consistent
(E).they are flexible

41. Adding together different amounts of red, green, and blue light to form colors is called
(A) mixing synthesis..
(B) additive color synthesis.
(C) subtractive synthesis.
(D) Both B and C are correct.
(E) None of the above is correct.

42. Using multiple processors to divide jobs into pieces, and work simultaneously on the pieces is
(A) multitasking.
(B) doubling.
(C) parallel processing.
(D) concurrency.
(E) RISC processing.

43. Which of the following can be described as a gateway with a lock that guards against unauthorized access to an internal network?
(A) a firewall
(B) a drawbridge
(C) access-control software
(D) an electronic guard dog
(E) None of the above is correct

44. The traditional type of cryptosystem used on computer networks is the
(A) encoded secret key system.
(B) symmetric secret key system.
(C) decrypted secret key system.
(D) encrypted secret key system.
(E) enforced secret key system.

45. In this type of network, each user can make files publicly available to other users on the network.
(A) LAN model
(B) client/server model
(C) NOS
(D) peer-to-peer model
(E) None of the above is correct.

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46. Which of the following is a server-side, HTML embedded scripting language used to create dynamic Web pages. It can perform any task any CGI program can do, but its strength lies in its compatibility with many types of databases.
(A) SSI
(B) JavaScript
(C) PHP
(D) VBScript
(E) Java applet

47. What is the result of performing a one-bit left circular shift on 5C (which is represented in hexadecimal notation)? Give your answer in hexadecimal form.
(A) 57
(B) B8
(C) 6F
(D) 6A
(E) None of the above is correct.

48. An organization that tends to limit its decision making to following the standard operating procedures developed over time has a
(A) political style.
(B) bureaucratic style.
(C) rational style.
(D) garbage can style.
(E) reflective style.

49. The following bytes were originally coded using odd parity. In which of them do you know that no error has occurred ?
(a) 10101101 (b) 10000001 (c) 00000000 (d) 11100000
(A) a b
(B) b c
(C) a d
(D) c d
(E) a c.

50. Which of the following travels independently over computer networks, seeking out uninfected workstations to occupy?
(A) worm
(B) logic bomb
(C) Trojan horse
(D) stalker
(E) macro virus

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Part I. Microeconomics (each question 2 points): choose the best answer (答錯不倒扣)

1. Henri spends his entire income on 3 sacks of acorns and 3 crates of butternuts. The price of acorns is 2 dollars per sack and his income is 33 dollars. He can just afford a commodity bundle with A sacks of acorns and B crates of butternuts which satisfies the budget equation:
(A) $2A + 11B = 33$
(B) $4A + 18B = 66$
(C) $4A + 9B = 33$
(D) $2A + 13B = 35$

2. Preferences are said to be monotonic if:
(A) all goods must be consumed in fixed proportions.
(B) all goods are perfect substitutes.
(C) more is always preferred to less.
(D) there is diminishing marginal rate of substitution.

3. Oswald Odd consumes only goods 1 and 2. His utility function is $U(x_1, x_2) = x_1 + x_2 + \min\{x_1, x_2\}$. Each of Oswald's indifference curves is:
(A) L-shaped.
(B) made up of 3 line segments with slopes -2, -1, and -1/2.
(C) made up of 2 line segments with slopes -2 and -1/2.
(D) is smooth and has no kinks.

4. Janet consumes two commodities x and y. Her utility function is $\min\{x + 2y, y + 2x\}$. She chooses to buy 10 units of good x and 20 units of good y. The price of good x is 1. Which of the following is true?
(A) Janet's income is 40.
(B) Janet's income is 50.
(C) Janet's income is 30.
(D) Janet's income is 20.

5. For $m > p_2$, the demand functions for goods 1 and 2 are given by the equations $x1 = (m/p_2) - 1$ and $x2 = p_1/p_2$, where m is income and pi and p_2 are prices. Let the horizontal axis represent the quantity of good 1. Let $p_1 = 1$ and $p_2 = 2$. Then for $m > 2$, the income offer curve is:
(A) a vertical line.
(B) a horizontal line.
(C) a straight line with slope 2.
(D) a straight line with a slope of 1/2.

6. If Charlie's utility function were $X_A X_B$, if apples cost 80 cents each, and if bananas cost 10 cents each, Charlie's budget line would be tangent to one of his indifference curves whenever the following equation is satisfied:
(A) $4X_B = 8X_A$
(B) $X_B = X_A$
(C) $X_A = 4X_B$
(D) $X_B = 4X_A$

7. When prices are (3, 1) Emily chooses the bundle (9,21), and when prices are (2,4) she chooses the bundle (8,14). Which of the following is true?
(A) The bundle (9, 21) is revealed preferred to the bundle (8,14) and she does not violate WARP.
(B)She violates SARP but not WARP.
(C) The bundle (8,14) is revealed preferred to the bundle (9, 21) and she does not violate WARP.
(D) She violates WARP.

8. Rob consumes two goods, x and y. He has an allowance of $50 per week and is not endowed with either of the goods. If the price of good x increases and his substitution and income effects change demand in opposite directions:
(A) good x must be a Giffen good.
(B) good x must be an inferior good.
(C) WARP is violated.
(D) good x must be a normal good.

9. Milton consumes two commodities in a perfectly competitive market system. The price of x is 2 and the price of y is 1. His utility function is U(x, y) = xy. He is endowed with 52 units of good x and no y. Find his consumption of good y.
(A) 62
(B) 57
(C) 26
(D) 52

10. Molly has income $400 in period 1 and income $480 in period 2. Her utility function is $c_1^a c_2^{1-a}$, where $a = 0.60$ and the interest rate is 0.20. If her income in period 1 doubled and her income in period 2 stayed the same, her consumption in period 1 would:
(A) double.
(B) increase by 240.
(C) increase by 120
(D) stay constant.

11. If the interest rate is r and will remain r forever, then a bond that will pay 45 dollars a year forever, starting 1 year from now, is worth how much today?
(A) 45/ (1 + r)
(B) 45(1 + r)
(C) 45/r
(D) $45/(1 + r + r^2 + ... + r^n + ...)$

12. Portia has waited a long time for her ship to come in and she has concluded that it will arrive today with probability 1/4. If it does come, she will receive $16. If it doesn't come in today, it never will and she will have zero wealth. She has a von Neumann-Morgenstern utility function equal to the square root of her total income. What is the minimum price at which she would sell the rights to her ship?
(A) 1
(B) 2
(C) 2.5
(D) 4

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23. A duopoly faces the inverse demand curve p = 160 - 2q. Both firms in the industry have constant costs of $10 per unit of output. In a Cournot equilibrium how much output will each duopolist sell?
(A) 75
(B) 54
(C) 25
(D) 35

24. Amaranda and Bartolo consume only two goods, x and y. They can trade only with each other and there is no production. The total endowment of Good x equals the total endowment of Good y. Amaranda's utility function is $U(x_A, y_A) = \min\{x_A, y_A\}$ and Bartolo's utility function is $U(x_B, y_B) = \max\{x_B, y_B\}$. In an Edgeworth box for Amaranda and Bartolo, the set of Pareto optimal allocations is:
(A) the main diagonal.
(B) both diagonals.
(C) the whole Edgeworth box.
(D) the edges of the box and the main diagonal.

25. Two stores are located side by side and attract customers to each other and to themselves by advertising. Where x_1 and x_2 are the advertising expenditures of stores 1 and 2, the profits of the firms are $(48 + x_2)x_1 - 2x_1^2$ for store 1 and $(54 + x_1)x_2 - 2x_2^2$ for store 2. Knowing these functions, one investor buys both stores. In order to maximize his total profits, how much should he spend on advertising for store 1?
(A)10
(B) 26
(C)25
(D) 35

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Part II. Macroeconomics (each question 2 points): choose the best answer.

26. Job openings are plentiful when the
A) Actual real GDP is above the natural real GDP.
B) Actual real GDP is above the actual real GDP.
C) Natural real GDP is increasing rapidly.
D) None of the above.

27. Which of the following statements regarding the implicit GDP deflator is false?
A) When the implicit GDP deflator is falling, the inflation rate is negative.
B) The inflation rate is simply the rate of change of the implicit GDP deflator.
C) The implicit GDP deflator is the ratio of prices actually charged in any single year to the prices charged in the base year.
D) The implicit GDP deflator for a given year is the ratio of real GDP to nominal GDP for that year.

28. When an economy is in equilibrium
A) Planned expenditures exceed production and income.
B) There is no savings nor investment.
C) Government tax revenues equal planned government expenditures.
D) Production and income equal planned expenditures.

29. If the gap between the actual level of output and the "natural real GDP" is 1000 and the marginal leakage rate is 0.5 then the simple Keynesian model suggests that the government could close the gap by
A) Increasing autonomous expenditures by 1000.
B) Increasing autonomous expenditures by 250.
C) Increasing autonomous expenditures by 500.
D) Decreasing taxed by 500.

30. If both autonomous imports and autonomous taxes decrease by $100B, we expect that equilibrium income will
A) Increase by more than $200B.
B) Decrease by more than $200B.
C) Increase by $200B.
D) Remain unchanged.

31. If the demand for money was totally independent of the interest rate, the
A) LM curve would have a positive slope and monetary policy would be quite powerful.
B) LM curve would have a positive slope and monetary policy would be impotent.
C) LM curve would be vertical and monetary policy would be a quite powerful.
D) LM curve would be vertical and monetary policy would be impotent.

32. A change in the multiplier will change the

A) Slope of the IS curve.

B) Slope and the position of the IS curve.

C) Slope of the LM curve.

D) Position of the LM curve.

33. If the level of interest rates paid on time deposits rise relative to that paid by money market accounts, ceteris paribus, individual will

A) Reduce their real money balances.

B) First reduce then increase their real money balances.

C) Increase their real money balances.

D) Hold the same amount of money.

34. Monetary policy will have a large income effect provided the

A) IS curve is flat.

B) LM curve is steep.

C) IS curve is steep.

D) LM curve is flat.

35. An "easy money, tight fiscal" policy combination will be preferred by a society which values

A) Low growth rates, but more goods and services in the future.

B) Public goods today greater than private goods in the future.

C) Private goods today more than public goods in the future.

D) Public and private goods in the future more than public and private goods today.

36. When foreign securities become more attractive to U.S. investors,

A) There is an outflow of dollars from the United States and the dollar appreciates.

B) There is an outflow of dollars form the United States and the dollar depreciates.

C) The foreign currencies depreciate relative to the dollar.

D) Imports into the United States will increase.

37. The effect on the IS curve of a reduction in taxes will be less the

A) Flatter is the LM curve.

B) Steeper is the LM curve.

C) Greater the extent of "crowding out."

D) Greater is the marginal propensity to save.

38. Monetary restraint and fiscal stimulus will

A) Both lower the real rate of interest.

B) Both raise the real rate of interest.

C) Have differing effects on the real rate of interest.

D) Both raise the level of output.

39. The Vietnam War required the U.S. government to spend large amounts of

dollars overseas. This effort

A) Raised the demand and supply of dollars by private companies.

B) Caused an excess demand for dollars, the exchange rate fell.

C) Caused an excess supply of dollars, the exchange rate fell.

D) Caused the dollar to appreciate.

40、Let the government increase lump-sum taxes. The aggregate demand curve will

A) Shift leftward and the IS curve will shift leftward.

B) Shift rightward and the IS curve will shift rightward.

C) Remain unaffected but the IS curve will shift leftward.

D) Become positively sloped but the IS curve will remain negatively sloped.

41、Which of the following factors will not cause the AD curve to shift?

A) Tax rates.

B) Autonomous exports.

C) Changes in the marginal product of labor.

D) Consumer confidence.

42、The position of the short-run aggregate supply curve depends on

A.) The price level.

B.) Workers' expectations.

C.) Aggregate demand.

D.) The actions of the monetary authority.

43、Given the firm's production function, the firm's demand for labor depends on the

A) Supply of labor.

B) Other firms' demand for labor.

C) Rate of population growth.

D) Real wage that is set for the firm by the market.

44、The term "monetary impotence" refers to the

A) Failure of firms to lower prices even when wages are falling.

B) Problem that an economy faces when industries are not perfectly competitive and prices do not fluctuate.

C) Failure of fiscal policy to drive down prices in a depression.

D) Inability of an increase in real balances to raise the level of output.

45、Keynes' argued that monetary policy would be impotent during the Great Depression because

A) Fall in interest rates would stimulate investment.

B) Fall in interest rates would not stimulate investment.

C) Rise in interest rates would not stimulate investment.

D) Rise in interest rates would stimulate investment.

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46、If forecasting errors are rational, then
A) People will always be error-prone.
B) They will be random, and thus independent of previous errors.
C) They will be independent of business firm production and price forecasts.
D) A and C are both correct.

47、The short-run Phillips curve gives
A) The actual short-run level of real GDP and inflation.
B) All possible combinations of real GDP and inflation, for a given set of expectations.
C) All possible combinations of real GDP and inflation, for fully adjusted expectations.
D) The response of real GDP and inflation to supply shocks.

48、The major side-effect of a stimulate fiscal policy is that it will
A) Discriminate in favor of housing.
B) Crowds out private expenditures.
C) Increase the natural rate of unemployment.
D) Permanently raise the rate of inflation.

49、Which of the following does not create a demand for French francs?
A) The repayment of a loan from a French company to an Italian bank.
B) The desire of a British company to purchase a French factory.
C) The declaration of a dividend by a Swedish company that has French shareholders.
D) The rise of the interest rate in France while other foreign interest rates remain constant.

50、The purchasing power parity theory predicts that
A) A nation's exchange rate will decline at a rate equal to the difference between the domestic and the foreign rates of inflation.
B) A nation's exchange rate will differ from another nation's exchange rate by an amount depending upon the difference between the domestic and foreign rates of inflation.
C) A nation's exchange rate is determined by the extent of speculation in the foreign-exchange market.
D) A nation's exchange rate will decline when there is a balance-of-payment deficit.