| 考試科目 | 統計學 4211A | 所別 | 企業管理研究所/甲組 | 考試時間 | 2月27日(六) 第三節 |
|---|---|---|---|---|---|

最終答案請以四捨五入方式，取至小數第三位。

1. **(65%)** A popular pastime has been dropping Mentors into fresh bottles of cola to generate a plume of fizzing bubbles（曼陀珠加可樂）. Does it matter whether diet soda is used? The following table gives the brand and type of soda (4 replications for each combination of Coke/Pepsi and diet/regular) and the height in inches of the plume generated.

| ***Brand*** | ***Type*** | ***Height* (inches)** | ***Group*** |
|---|---|---|---|
| Coke | Diet | 70 | Diet Coke |
| Coke | Diet | 90 | Diet Coke |
| Coke | Diet | 77 | Diet Coke |
| Coke | Diet | 83 | Diet Coke |
| Coke | Regular | 40 | Regular Coke |
| Coke | Regular | 48 | Regular Coke |
| Coke | Regular | 35 | Regular Coke |
| Coke | Regular | 40 | Regular Coke |
| Pepsi | Diet | 80 | Diet Pepsi |
| Pepsi | Diet | 65 | Diet Pepsi |
| Pepsi | Diet | 95 | Diet Pepsi |
| Pepsi | Diet | 80 | Diet Pepsi |
| Pepsi | Regular | 50 | Regular Pepsi |
| Pepsi | Regular | 47 | Regular Pepsi |
| Pepsi | Regular | 26 | Regular Pepsi |
| Pepsi | Regular | 40 | Regular Pepsi |

$\mu_D$ and $\mu_R$ denote the population means of ***Height*** for Diet and Regular, respectively. $\sigma_D^2$ and $\sigma_R^2$ denote the population variances of ***Height*** for Diet and Regular, respectively. $\mu_C$ and $\mu_P$ denote the population means of ***Height*** for Coke and Pepsi, respectively. $\mu_1$, $\mu_2$, $\mu_3$, and $\mu_4$ indicate the population ***Group*** means of ***Height*** for Diet Coke, Regular Coke, Diet Pepsi, and Regular Pepsi, respectively. Assume that the values of ***Height*** for both Diet and Regular follow normal distributions. Consider two dummy variables for Brand and Type. Let ***Brand*** be 1 for Coke and 0 for Pepsi. While ***Type*** is 1 for Diet and 0 for regular.

Answer the following questions. Use the 0.05 level of significance for hypothesis test.

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|---|---|---|---|---|---|

(1) Draw a box and whisker plot of all observations for ***Height*** and point out any possible outliers in the data. (10%)

(2) Please examine whether $\mu_R$ is equal to 42. (6%)

(3) Construct a 95% confidence interval for $\mu_C - \mu_P$. (8%)

(4) Assume that $\sigma_D^2 = \sigma_R^2$. Please conduct a test for $H_0 : \mu_D = \mu_R$ versus $H_1 : \mu_D > \mu_R$. (8%)

(5) Fit and interpret a simple linear regression of ***Height*** on ***Type***. (10%)

(6) Fit and interpret a multiple linear regression of ***Height*** on ***Brand*** and ***Type***. Compare the result with that of part (5). (8%)

(7) Conduct a one-way analysis of variance to test $H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$. (15%)

2. **(20%)** A type of new car is offered for sale with 4 option packages. A customer can buy any number of these, from none to all 4. A manager proposes the null hypothesis that customers pick packages at random, implying the number of packages bought by a customer should be binomial with $n$=4. The following table shows the number of packages chosen by 400 customers.

| # | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Customers | 20 | 90 | 140 | 120 | 30 |

Find the

(1) Binomial parameter $p$ needed to compute the expected counts. (5%)

(2) Estimated probability that a customer picks one option. (5%)

(3) The value of $\chi^2$ statistic for testing $H_0$ and your conclusion at the 0.05 level of significance. (10%)

3. **(15%)** A textile mill produces fabric used in the production of dresses. Each dress is assembled from patterns that require 2 square yards of the material. Quality monitoring typically finds 12 defects per 100 square yards when testing sections of this fabric.

(1) What kind of distribution model will be suited to this application? (2%)

(2) Determine the mean and standard deviation of the number of defects for the material used to make a dress. (4%)

(3) Determine the probability of a defect in the material used to make a dress. (5%)

(4) If there is an increase in amount of fabric from 2 to 4 square yards, determine the mean and standard deviation for the number of defects in the fabric used to make a dress. (4%)

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|---|---|---|---|---|---|

附表一　$t$ 分配

**t-table (right tail)**

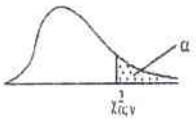
For each row (degrees of freedom $k$ ) and column (right tail probability $\alpha$ ), the table entry $e$ satisfies $\Pr(t_k \geq e) = \alpha$ . Note that the $t$-distribution is symmetric about 0.

| degrees of freedom | right tail probability | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.10 | 0.05 | 0.025 | 0.01 |
| 1 | 1.000 | 3.078 | 6.314 | 12.706 | 31.821 |
| 2 | 0.816 | 1.886 | 2.920 | 4.303 | 6.965 |
| 3 | 0.765 | 1.638 | 2.353 | 3.182 | 4.541 |
| 4 | 0.741 | 1.533 | 2.132 | 2.776 | 3.747 |
| 5 | 0.727 | 1.476 | 2.015 | 2.571 | 3.365 |
| 6 | 0.718 | 1.440 | 1.943 | 2.447 | 3.143 |
| 7 | 0.711 | 1.415 | 1.895 | 2.365 | 2.998 |
| 8 | 0.706 | 1.397 | 1.860 | 2.306 | 2.896 |
| 9 | 0.703 | 1.383 | 1.833 | 2.262 | 2.821 |
| 10 | 0.700 | 1.372 | 1.812 | 2.228 | 2.764 |
| 11 | 0.697 | 1.363 | 1.796 | 2.201 | 2.718 |
| 12 | 0.695 | 1.356 | 1.782 | 2.179 | 2.681 |
| 13 | 0.694 | 1.350 | 1.771 | 2.160 | 2.650 |
| 14 | 0.692 | 1.345 | 1.761 | 2.145 | 2.624 |
| 15 | 0.691 | 1.341 | 1.753 | 2.131 | 2.602 |
| 16 | 0.690 | 1.337 | 1.746 | 2.120 | 2.583 |
| 17 | 0.689 | 1.333 | 1.740 | 2.110 | 2.567 |
| 18 | 0.688 | 1.330 | 1.734 | 2.101 | 2.552 |
| 19 | 0.688 | 1.328 | 1.729 | 2.093 | 2.539 |
| 20 | 0.687 | 1.325 | 1.725 | 2.086 | 2.528 |
| 21 | 0.686 | 1.323 | 1.721 | 2.080 | 2.518 |
| 22 | 0.686 | 1.321 | 1.717 | 2.074 | 2.508 |
| 23 | 0.685 | 1.319 | 1.714 | 2.069 | 2.500 |
| 24 | 0.685 | 1.318 | 1.711 | 2.064 | 2.492 |
| 25 | 0.684 | 1.316 | 1.708 | 2.060 | 2.485 |
| 26 | 0.684 | 1.315 | 1.706 | 2.056 | 2.479 |
| 27 | 0.684 | 1.314 | 1.703 | 2.052 | 2.473 |
| 28 | 0.683 | 1.313 | 1.701 | 2.048 | 2.467 |
| 29 | 0.683 | 1.311 | 1.699 | 2.045 | 2.462 |
| 30 | 0.683 | 1.310 | 1.697 | 2.042 | 2.457 |
| 35 | 0.682 | 1.306 | 1.690 | 2.030 | 2.438 |
| 40 | 0.681 | 1.303 | 1.684 | 2.021 | 2.423 |
| 45 | 0.680 | 1.301 | 1.679 | 2.014 | 2.412 |
| 50 | 0.679 | 1.299 | 1.676 | 2.009 | 2.403 |
| gaussian | 0.675 | 1.282 | 1.646 | 1.962 | 2.330 |

| 考試科目 | 統計學 4211A | 所別 | 企業管理研究所/甲組 | 考試時間 | 2月27日(六) 第三節 |
|---|---|---|---|---|---|

附表二　卡方分配

**Table of the Chi-square Distribution**




| α = | 0.995 | 0.99 | 0.98 | 0.975 | 0.95 | 0.90 | 0.80 | 0.20 | 0.10 | 0.05 | 0.025 | 0.02 | 0.01 | 0.005 | 0.001 | =α |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V = 1 | 0.0000393 | 0.000157 | 0.000628 | 0.000982 | 0.00393 | 0.0158 | 0.0642 | 1.642 | 2.706 | 3.841 | 5.024 | 5.412 | 6.635 | 7.879 | 10.827 | V = 1 |
| 2 | 0.0100 | 0.0201 | 0.0404 | 0.0506 | 0.103 | 0.211 | 0.446 | 3.219 | 4.605 | 5.991 | 7.378 | 7.824 | 9.210 | 10.597 | 13.815 | 2 |
| 3 | 0.0717 | 0.115 | 0.185 | 0.216 | 0.352 | 0.584 | 1.005 | 4.642 | 6.251 | 7.815 | 9.348 | 9.837 | 11.345 | 12.838 | 16.268 | 3 |
| 4 | 0.207 | 0.297 | 0.429 | 0.484 | 0.711 | 1.064 | 1.649 | 5.989 | 7.779 | 9.488 | 11.143 | 11.668 | 13.277 | 14.860 | 18.465 | 4 |
| 5 | 0.412 | 0.554 | 0.752 | 0.831 | 1.145 | 1.610 | 2.343 | 7.289 | 9.236 | 11.070 | 12.832 | 13.388 | 15.086 | 16.750 | 20.517 | 5 |
| 6 | 0.676 | 0.872 | 1.134 | 1.237 | 1.635 | 2.204 | 3.070 | 8.558 | 10.645 | 12.592 | 14.449 | 15.033 | 16.812 | 18.548 | 22.457 | 6 |
| 7 | 0.989 | 1.239 | 1.564 | 1.690 | 2.167 | 2.833 | 3.822 | 9.803 | 12.017 | 14.067 | 16.013 | 16.622 | 18.475 | 20.278 | 24.322 | 7 |
| 8 | 1.344 | 1.646 | 2.032 | 2.180 | 2.733 | 3.490 | 4.594 | 11.030 | 13.362 | 15.507 | 17.535 | 18.168 | 20.090 | 21.955 | 26.125 | 8 |
| 9 | 1.735 | 2.088 | 2.532 | 2.700 | 3.325 | 4.168 | 5.380 | 12.242 | 14.684 | 16.919 | 19.023 | 19.679 | 21.666 | 23.589 | 27.877 | 9 |
| 10 | 2.156 | 2.558 | 3.059 | 3.247 | 3.940 | 4.865 | 6.179 | 13.442 | 15.987 | 18.307 | 20.483 | 21.161 | 23.209 | 25.188 | 29.588 | 10 |
| 11 | 2.603 | 3.053 | 3.609 | 3.816 | 4.575 | 5.578 | 6.989 | 14.631 | 17.275 | 19.675 | 21.920 | 22.618 | 24.725 | 26.757 | 31.264 | 11 |
| 12 | 3.074 | 3.571 | 4.178 | 4.404 | 5.226 | 6.304 | 7.807 | 15.812 | 18.549 | 21.026 | 23.337 | 24.054 | 26.217 | 28.300 | 32.909 | 12 |
| 13 | 3.565 | 4.107 | 4.765 | 5.009 | 5.892 | 7.042 | 8.634 | 16.985 | 19.812 | 22.362 | 24.736 | 25.472 | 27.688 | 29.819 | 34.528 | 13 |
| 14 | 4.075 | 4.660 | 5.368 | 5.629 | 6.571 | 7.790 | 9.467 | 18.151 | 21.064 | 23.685 | 26.119 | 26.873 | 29.141 | 31.319 | 36.123 | 14 |
| 15 | 4.601 | 5.229 | 5.985 | 6.262 | 7.261 | 8.547 | 10.307 | 19.311 | 22.307 | 24.996 | 27.488 | 28.259 | 30.578 | 32.801 | 37.697 | 15 |
| 16 | 5.142 | 5.812 | 6.614 | 6.908 | 7.962 | 9.312 | 11.152 | 20.465 | 23.542 | 26.296 | 28.845 | 29.633 | 32.000 | 34.267 | 39.252 | 16 |
| 17 | 5.697 | 6.408 | 7.255 | 7.564 | 8.672 | 10.085 | 12.002 | 21.615 | 24.769 | 27.587 | 30.191 | 30.995 | 33.409 | 35.718 | 40.790 | 17 |
| 18 | 6.265 | 7.015 | 7.906 | 8.231 | 9.390 | 10.865 | 12.857 | 22.760 | 25.989 | 28.869 | 31.526 | 32.346 | 34.805 | 37.156 | 42.312 | 18 |
| 19 | 6.844 | 7.633 | 8.567 | 8.907 | 10.117 | 11.651 | 13.716 | 23.900 | 27.204 | 30.144 | 32.852 | 33.687 | 36.191 | 38.582 | 43.820 | 19 |
| 20 | 7.434 | 8.260 | 9.237 | 9.591 | 10.851 | 12.443 | 14.578 | 25.038 | 28.412 | 31.410 | 34.170 | 35.020 | 37.566 | 39.997 | 45.315 | 20 |
| 21 | 8.034 | 8.897 | 9.915 | 10.283 | 11.591 | 13.240 | 15.445 | 26.171 | 29.615 | 32.671 | 35.479 | 36.343 | 38.932 | 41.401 | 46.797 | 21 |
| 22 | 8.643 | 9.542 | 10.600 | 10.982 | 12.338 | 14.041 | 16.314 | 27.301 | 30.813 | 33.924 | 36.781 | 37.659 | 40.289 | 42.796 | 48.268 | 22 |
| 23 | 9.260 | 10.196 | 11.293 | 11.688 | 13.091 | 14.848 | 17.187 | 28.429 | 32.007 | 35.172 | 38.076 | 38.968 | 41.638 | 44.181 | 49.728 | 23 |
| 24 | 9.886 | 10.856 | 11.992 | 12.401 | 13.848 | 15.659 | 18.062 | 29.553 | 33.196 | 36.415 | 39.364 | 40.270 | 42.980 | 45.558 | 51.179 | 24 |
| 25 | 10.520 | 11.524 | 12.697 | 13.120 | 14.611 | 16.473 | 18.940 | 30.675 | 34.382 | 37.652 | 40.646 | 41.566 | 44.314 | 46.928 | 52.620 | 25 |
| 26 | 11.160 | 12.198 | 13.409 | 13.844 | 15.379 | 17.292 | 19.820 | 31.795 | 35.563 | 38.885 | 41.923 | 42.856 | 45.642 | 48.290 | 54.052 | 26 |
| 27 | 11.808 | 12.879 | 14.125 | 14.573 | 16.151 | 18.114 | 20.703 | 32.912 | 36.741 | 40.113 | 43.194 | 44.140 | 46.963 | 49.645 | 55.476 | 27 |
| 28 | 12.461 | 13.565 | 14.847 | 15.308 | 16.928 | 18.939 | 21.588 | 34.027 | 37.916 | 41.337 | 44.461 | 45.419 | 48.278 | 50.993 | 56.893 | 28 |
| 29 | 13.121 | 14.256 | 15.574 | 16.047 | 17.708 | 19.768 | 22.475 | 35.139 | 39.087 | 42.557 | 45.722 | 46.693 | 49.588 | 52.336 | 58.302 | 29 |
| 30 | 13.787 | 14.953 | 16.306 | 16.791 | 18.493 | 20.599 | 23.364 | 36.250 | 40.256 | 43.773 | 46.979 | 47.962 | 50.892 | 53.672 | 59.703 | 30 |
| 40 | 20.706 | 22.164 | 23.838 | 24.433 | 26.509 | 29.051 | 32.345 | 47.269 | 51.805 | 55.759 | 59.342 | 60.436 | 63.691 | 66.766 | 73.402 | 40 |
| 50 | 27.991 | 29.707 | 31.664 | 32.357 | 34.764 | 37.689 | 41.449 | 58.164 | 63.167 | 67.505 | 71.420 | 72.613 | 76.154 | 79.490 | 86.661 | 50 |
| 60 | 35.535 | 37.485 | 39.699 | 40.482 | 43.188 | 46.459 | 50.641 | 68.972 | 74.397 | 79.082 | 83.298 | 84.580 | 88.379 | 91.952 | 99.607 | 60 |
| 70 | 43.275 | 45.442 | 47.893 | 48.758 | 51.739 | 55.329 | 59.898 | 79.715 | 85.527 | 90.531 | 95.023 | 96.388 | 100.425 | 104.215 | 112.317 | 70 |
| 80 | 51.171 | 53.539 | 56.213 | 57.153 | 60.391 | 64.278 | 69.207 | 90.405 | 96.578 | 101.880 | 106.629 | 108.069 | 112.329 | 116.321 | 124.839 | 80 |
| 90 | 59.196 | 61.754 | 64.634 | 65.646 | 69.126 | 73.291 | 78.558 | 101.054 | 107.565 | 113.145 | 118.136 | 119.648 | 124.116 | 128.299 | 137.208 | 90 |
| 100 | 67.327 | 70.065 | 73.142 | 74.222 | 77.929 | 82.358 | 87.945 | 111.667 | 118.498 | 124.342 | 129.561 | 131.142 | 135.807 | 140.170 | 149.449 | 100 |

| 考試科目 | 統計學 申211A | 所別 | 企業管理研究所/甲組 | 考試時間 | 2月27日(六) 第三節 |
|---|---|---|---|---|---|

附表三　F 分配

F - Distribution ($\alpha = 0.05$ in the Right Tail)

| $df_2$ \ $df_1$ | Numerator Degrees of Freedom | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Denominator Degrees of Freedom | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 161.45 | 199.50 | 215.71 | 224.58 | 230.16 | 233.99 | 236.77 | 238.88 | 240.54 |
| 2 | 18.513 | 19.000 | 19.164 | 19.247 | 19.296 | 19.330 | 19.353 | 19.371 | 19.385 |
| 3 | 10.128 | 9.5521 | 9.2766 | 9.1172 | 9.0135 | 8.9406 | 8.8867 | 8.8452 | 8.8123 |
| 4 | 7.7086 | 6.9443 | 6.5914 | 6.3882 | 6.2561 | 6.1631 | 6.0942 | 6.0410 | 6.9988 |
| 5 | 6.6079 | 5.7861 | 5.4095 | 5.1922 | 5.0503 | 4.9503 | 4.8759 | 4.8183 | 4.7725 |
| 6 | 5.9874 | 5.1433 | 4.7571 | 4.5337 | 4.3874 | 4.2839 | 4.2067 | 4.1468 | 4.0990 |
| 7 | 5.5914 | 4.7374 | 4.3468 | 4.1203 | 3.9715 | 3.8660 | 3.7870 | 3.7257 | 3.6767 |
| 8 | 5.3177 | 4.4590 | 4.0662 | 3.8379 | 3.6875 | 3.5806 | 3.5005 | 3.4381 | 3.3881 |
| 9 | 5.1174 | 4.2565 | 3.8625 | 3.6331 | 3.4817 | 3.3738 | 3.2927 | 3.2296 | 3.1789 |
| 10 | 4.9646 | 4.1028 | 3.7083 | 3.4780 | 3.3258 | 3.2172 | 3.1355 | 3.0717 | 3.0204 |
| 11 | 4.8443 | 3.9823 | 3.5874 | 3.3567 | 3.2039 | 3.0946 | 3.0123 | 2.9480 | 2.8962 |
| 12 | 4.7472 | 3.8853 | 3.4903 | 3.2592 | 3.1059 | 2.9961 | 2.9134 | 2.8486 | 2.7964 |
| 13 | 4.6672 | 3.8056 | 3.4105 | 3.1791 | 3.0254 | 2.9153 | 2.8321 | 2.7669 | 2.7144 |
| 14 | 4.6001 | 3.7389 | 3.3439 | 3.1122 | 2.9582 | 2.8477 | 2.7642 | 2.6987 | 2.6458 |
| 15 | 4.5431 | 3.6823 | 3.2874 | 3.0556 | 2.9013 | 2.7905 | 2.7066 | 2.6408 | 2.5876 |
| 16 | 4.4940 | 3.6337 | 3.2389 | 3.0069 | 2.8524 | 2.7413 | 2.6572 | 2.5911 | 2.5377 |
| 17 | 4.4513 | 3.5915 | 3.1968 | 2.9647 | 2.8100 | 2.6987 | 2.6143 | 2.5480 | 2.4943 |
| 18 | 4.4139 | 3.5546 | 3.1599 | 2.9277 | 2.7729 | 2.6613 | 2.5767 | 2.5102 | 2.4563 |
| 19 | 4.3807 | 3.5219 | 3.1274 | 2.8951 | 2.7401 | 2.6283 | 2.5435 | 2.4768 | 2.4227 |
| 20 | 4.3512 | 3.4928 | 3.0984 | 2.8661 | 2.7109 | 2.5990 | 2.5140 | 2.4471 | 2.3928 |
| 21 | 4.3248 | 3.4668 | 3.0725 | 2.8401 | 2.6848 | 2.5727 | 2.4876 | 2.4205 | 2.3660 |
| 22 | 4.3009 | 3.4434 | 3.0491 | 2.8167 | 2.6613 | 2.5491 | 2.4638 | 2.3965 | 2.3419 |
| 23 | 4.2793 | 3.4221 | 3.0280 | 2.7955 | 2.6400 | 2.5277 | 2.4422 | 2.3748 | 2.3201 |
| 24 | 4.2597 | 3.4028 | 3.0088 | 2.7763 | 2.6207 | 2.5082 | 2.4226 | 2.3551 | 2.3002 |
| 25 | 4.2417 | 3.3852 | 2.9912 | 2.7587 | 2.6030 | 2.4904 | 2.4047 | 2.3371 | 2.2821 |
| 26 | 4.2252 | 3.3690 | 2.9752 | 2.7426 | 2.5868 | 2.4741 | 2.3883 | 2.3205 | 2.2655 |
| 27 | 4.2100 | 3.3541 | 2.9604 | 2.7278 | 2.5719 | 2.4591 | 2.3732 | 2.3053 | 2.2501 |
| 28 | 4.1960 | 3.3404 | 2.9467 | 2.7141 | 2.5581 | 2.4453 | 2.3593 | 2.2913 | 2.2360 |
| 29 | 4.1830 | 3.3277 | 2.9340 | 2.7014 | 2.5454 | 2.4324 | 2.3463 | 2.2783 | 2.2229 |
| 30 | 4.1709 | 3.3158 | 2.9223 | 2.6896 | 2.5336 | 2.4205 | 2.3343 | 2.2662 | 2.2107 |
| 40 | 4.0847 | 3.2317 | 2.8387 | 2.6060 | 2.4495 | 2.3359 | 2.2490 | 2.1802 | 2.1240 |
| 60 | 4.0012 | 3.1504 | 2.7581 | 2.5252 | 2.3683 | 2.2541 | 2.1665 | 2.0970 | 2.0401 |
| 120 | 3.9201 | 3.0718 | 2.6802 | 2.4472 | 2.2899 | 2.1750 | 2.0868 | 2.0164 | 1.9588 |
| ∞ | 3.8415 | 2.9957 | 2.6049 | 2.3719 | 2.2141 | 2.0986 | 2.0096 | 1.9384 | 1.8799 |

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
|---|---|

# 國立政治大學　105　學年度碩士班招生考試試題



| 考試科目 | 管理學 4211B 4212B | 所別 | 企業管理研究所（MBA 學位學程） | 考試時間 | 2 月 27 日(六) 第 三 節 |
|---|---|---|---|---|---|

共計四題申論題，每題 25 分。請按題號順序作答，以利閱卷。
作答時不可參考任何紙張、書本、筆記、及工具等，全部用中文作答，
專有名辭必要時可以用英文表達。
作答時可以提出觀念圖形，但必須輔以文字說明。

一、 企業組織的運作就上下與左右來劃分的話，可分成向上管理、向下管理、與水平橫向管理，請說明以上三種組織運作情境之下的管理內涵或焦點議題為何。

二、 請闡釋平衡計分卡的主張與內涵，試以策略地圖就特定管理現象說明其應用案例。

三、 請解釋傳統式組織設計原理，因應當代營運環境挑戰，近代產生了哪些新型的設計思維？

四、 試就你所熟知的國內外企業，擇一說明其經營理念與運作模式的特色。

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
|---|---|

| 考試科目 | 微積分 4212A | 所別 | 企管研究所乙組 | 考試時間 | 2月27日（六）第三節 |
|---|---|---|---|---|---|

**※ Show all calculations and display answers clearly. Unjustified answers will receive no credit.**

1. (a) Find $\frac{dy}{dx}$, where $y = (\ln x)^{\ln x}$.

   (b) Evaluate the limit: $\lim_{x\to 0+}(1+5x)^{2/x}$ . (10%).

2. Let $x = t^5 + 10t^2 + 5t + 2$ and $y = \frac{x}{x^2+1}$. Find $\left.\frac{dy}{dt}\right|_{t=0}$ and $\left.\frac{d^2y}{dt^2}\right|_{t=0}$. (10%)

3. Using Lagrange multipliers, find the distance from the point A(1,2,3) to the point on the plane $x - 2y + 2z = 6$ closest to A. (10%)

4. The temperature x miles east and y miles north of a weather station is given by the function $f(x, y) = 24 + 2x - y$. Find the average temperature over the region $R = \{(x, y) | 0 \le x \le y, 0 \le y \le 2\}$. (10%)

5. A company's profit in dollars from producing x tape decks and y CD player per day is $P(x, y) = 3x^2 - xy + 2y^2$. If the company currently produces 200 tape decks and 500 CD players, use the marginal profit function to estimate the change in profit that would result from producing one more CD player. (10%)

6. A company manufactures two products. Product A costs \$35 per unit to manufacture and product B costs \$55 per unit to manufacture. Marketing research indicates that if the company makes x product A and y product B per month and wants to sell them all, they will have to sell product A at a price of $150 - \frac{1}{2}x + \frac{1}{2}y$ dollars per unit and product B at a price of $225 + \frac{1}{2}x - y$ dollars per unit. Find the quantities and the prices of the two products that maximize profit. (10%)

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
|---|---|

| 考試科目 | 微積分(4312A) | 所別 | 企管研究所乙組 | 考試時間 | 2月27日(六) 第三節 |
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7. A manufacturer produces erasers. The fixed cost is \$12000 per week. The marginal cost for producing x erasers per week is $5 + \frac{x}{5000}$ dollars. According to marketing research, the demand function is $D(p) = 200000 - 10000p,\ 0 \le p \le 20$. Here p is the selling price in dollars and $D(p)$ is the number of erasers that will be sold per week at price p. How many erasers should they make and sell per week to maximize their profit? (10%)

8. (a) The function $f(x)$ is defined by

$$f(x) = \sum_{n=0}^{\infty} (n+1)2^{n+1}x^n$$

Determine the radius of convergence.

(b) Write the power series for $g(x) = \int_0^x f(t)dt$ and compute the sum of the series.

(c) Compute the sum of the series in (a). (15%)

9. Evaluate the following integrals.

(a) $\int_1^4 \frac{1}{\sqrt{x}(\sqrt{x}+1)^2}dx$　(b) $\int_0^1 xe^x dx$　(c) $\int \frac{1}{x^2-1}dx$ (15%)

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
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| 考試科目 | 經濟學 | 所別 | 高階英文同科 | 考試時間 | 2 月 27 日（六）第 1 節 |
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## Multiple Choice (1 point each)

**Identify the letter of the choice that best completes the statement or answers the question.**

1. Assume that the price elasticity of demand for good $X$ is constant and equal to $-0.5$, and the price elasticity of demand for good $Y$ is constant and equal to $-2$. Assume that goods $X$ and $Y$ have identical upward-sloping elastic supply curves. If a per-unit excise tax of the same amount is levied on good $X$ and on good $Y$, which of the following would be true?

A. The percentage decrease in the quantity of good $X$ demanded would be greater than the percentage decrease in the quantity of good $Y$ demanded.

B. The tax share paid by consumers of good $X$ would be relatively higher than that paid by consumers of good $Y$.

C. The tax share paid by consumers of good $Y$ would be relatively higher than that paid by consumers of good $X$.

D. The tax share paid by sellers of good $Y$ would be relatively lower than that paid by sellers of good $X$.

2. If the income elasticity of demand for good $X$ is negative and the cross-price elasticity of demand between good $X$ and good $Y$ is negative, which of the following must be true of good $X$?

A. $X$ is a normal good and is a substitute for $Y$.

B. $X$ is a normal good and is a complement to $Y$.

C. $X$ is an inferior good and is a substitute for $Y$.

D. $X$ is an inferior good and is a complement to $Y$.

3. If an industry ignores the external costs it generates in its production, which of the following will be true at the competitive market equilibrium output?

A. Price will be greater than the marginal social cost.

B. Price will be less than the marginal social cost.

C. Price will be equal to the marginal social cost.

D. Marginal private cost will be greater than the marginal social cost.

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
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| 考試科目 | 經濟學 | 所別 | 金融英同科 | 考試時間 | 2月27日（六）第1節 |
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4. Karen works part-time at a local convenience store and earns $10 per hour. She wants to spend next Saturday afternoon attending a music concert. The full price of a concert ticket is $75, but Karen was able to get a discounted price of $50 from a friend who purchased the ticket but has become unable to attend. If Karen took 4 hours off from her job to attend the concert, what was her opportunity cost of attending the concert?

A. $40

B. $50

C. $90

D. $125

5. Which of the following is true of the substitution effect of an increase in the price of a normal good?

A. It works to offset the income effect.

B. It works to reinforce the income effect.

C. It is less than the income effect.

D. It causes an increase in the quantity demanded of the good.

6. A firm employs unskilled and skilled labor in a cost-minimizing mix at its manufacturing plant. The marginal product of unskilled labor is considerably lower than skilled labor. The equilibrium wage of the unskilled labor is only NT$90 per hour. The government passes a law that mandates a minimum wage of NT$120 per hour. Equilibrium wages for skilled workers exceed this minimum wage and therefore are not affected by the new law. The firm will most likely respond to the imposition of the minimum wage law by:

A. employing fewer skilled workers and allocate their salaries to unskilled workers.

B. keeping the mix of unskilled and skilled workers the same.

C. employing more unskilled workers at its plant.

D. employing fewer unskilled workers at its plant.

7. The short-term shutdown point of production for a firm operating under perfect competition will most likely occur when:

A. price is equal to average total cost.

B. marginal revenue is equal to marginal cost.

C. marginal revenue is less than average variable costs.

D. price is less than the marginal cost.

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
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| 考試科目 | 經濟學 | 所別 | 商院共同科 | 考試時間 | 2月27日（六）第1節 |
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8. Which of the following might cause a monopoly to exist?

I. Economies of scale

II. A single firm owning a key resource

III. A firm owning a patent on a product

IV. A firm being a price taker

V. Price discrimination

A. I, II, and III only.

B. II, III, and V only.

C. I, II and IV only.

D. II, III and V only.

9. Which of the following events could cause an increase in the production of labor?

I. Office workers receive faster computers.

II. Wages for textile workers rise.

III. More useful tools are given to a construction crew working on a house.

IV. The minimum wage law is enforced.

V. Bank clerks take a training course.

A. I and III only.

B. I, III and V only.

C. I, II, and IV only.

D. II, IV, and V only.

10. Companies most likely have a well-defined supply function when the market structure is

A. oligopoly.

B. monopoly.

C. perfect competition.

D. monopolistic competition.

11. Suppose that a country produces only two goods, $x$ and $y$. In year 2012, the price of $x$ is $P_x = 5$ and the production level is $Q_x = 5$. The price and production level of $y$ are $P_y = 5$ and $Q_y = 5$. In year 2015, they are $P_x = 10$, $Q_x = 2.5$, $P_y = 10$, and $Q_y = 2.5$. If the base year is 2012, how the nominal and real GDP change between 2012 and 2015.

A. The nominal GDP does not change. The real GDP decreases.

B. The nominal GDP increases. The real GDP increases.

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C. The nominal GDP decreases. The real GDP decreases.

D. The nominal GDP does not change. The real GDP increases.

12. In the Keynesian model, the output is more sensitive to the change of money supply if

A. investment is more elastic to changes in interest rate.

B. the unemployment is high.

C. the country trades more with rest of the world.

D. the country has been operating on the production possibility frontier.

13. If the central bank purchases government bonds from the public,

A. supply of money increases.

B. interest rate increases.

C. the discount rate increases.

D. the price of bond decreases.

14. The natural rate of unemployment is the unemployment rate when the country

A. has zero growth rate.

B. has no inflation.

C. has only cyclical and structural unemployment.

D. operates on the production possibility frontier.

15. When the central bank increases the money supply, according to the short-run Philips curve, which of the following is true?

A. Both the unemployment rate and the inflation rate will decrease.

B. Both the unemployment rate and the inflation rate will not change.

C. The unemployment rate will decrease but the inflation rate will increase.

D. Both the unemployment rate and the inflation rate will increase.

16. Which of the following will decrease U.S. net capital outflow?

A. capital flight from the United States

B. the government budget deficit increases

C. the U.S. imposes import quotas

D. None of the above is correct.

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
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| 考試科目 | 經濟學 | 所別 | 商院共同科 | 考試時間 | 2月17日（六）第1節 |
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17. An economic contraction caused by a shift in aggregate demand remedies itself over time as the expected price level

A. rises, shifting aggregate demand right.

B. rises, shifting aggregate demand left.

C. falls, shifting aggregate supply right.

D. falls, shifting aggregate supply left.

18. The term *crowding-out effect* refers to

A. the reduction in aggregate supply that results when a monetary expansion causes the interest rate to decrease.

B. the reduction in aggregate demand that results when a monetary expansion causes the interest rate to decrease.

C. the reduction in aggregate demand that results when a fiscal expansion causes the interest rate to increase.

D. the reduction in aggregate demand that results when a decrease in government spending or an increase in taxes causes the interest rate to increase.

19. Given a nominal interest rate of 20 percent, in which case would you earn the highest after-tax real interest rate?

A. Inflation is 5 percent; the tax rate on interest income is 20 percent.

B. Inflation is 4 percent; the tax rate on interest income is 30 percent.

C. Inflation is 3 percent; the tax rate on interest income is 40 percent.

D. The after-tax real interest rate is the same for all of the above.

20. If output is above its natural rate, then according to sticky-wage theory

A. workers and firms will strike bargains for higher wages. This increase in wages shifts the short-run aggregate supply curve right.

B. workers and firms will strike bargains for higher wages. This increase in wages shifts the short-run aggregate supply curve left.

C. workers and firms will strike bargains for lower wages. This decrease in wages shifts the short-run aggregate supply curve right.

D. workers and firms will strike bargains for lower wages. This decrease in wages shifts the short-run aggregate supply curve left.

| 考試科目 | 經濟學 | 所別 | 商院共同科 | 考試時間 | 2月27日（六）第1節 |
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## Problems and Short-essay Questions

**Please answer the following questions IN SEQUENCE. All questions may be answered in either Chinese or English.**

1. Assume that sugar production in the U.S.A. was 15.6 billion pounds, and sugar consumption in the U.S.A. was 21.1 billion pounds in 1995. In the same year, price of sugar in the U.S.A. was 21.9 cents per pound, while the world price was 11.1 cents per pound.

a. (5 points) With a -0.3 price elasticity of demand, derive the demand function of the sugar in the U.S.A. in 1995. (Assume that the demand function of sugar is linear.)

b. (5 points) With a 1.5 price elasticity of supply, derive the supply function of the sugar in the U.S.A. in 1995. (Assume that the supply function of sugar is linear.)

c. (5 points) Compute the loss of consumer's surplus caused by the higher sugar price in the U.S.A.

d. (5 points) Compute the changes in producer's surplus caused by the higher sugar price in the U.S.A.

2. The processing of payroll for the workers of a major corporation can be done to varying degrees by clerks and computers. Suppose that we can represent the trade-offs between labor and capital by the following production function $Q = K^{3/4}L^{1/4}$. $Q$ is measured in thousands of payment processed, $K$ is measured in hours of processing time and $L$ is measured in man-hours.

a. (5 points) Does the production function exhibit constant, increasing, or decreasing returns to scale? Please show your result with a simple demonstration or proof.

For the remainder of the question you may assume that the wage rate is NT$160 per man-hour and the rental rate of capital is NT$30 per hour.

b. (5 points) Given the prices of the inputs and the production function, find the compensated factor demands for labor and capital.

c. (5 points) What is the variable cost curve of the firm? If fixed costs are 100, then what is the total cost curve of the firm.

d. (5 points) Without calculating the derivative, are marginal costs constant, upward sloping, or downward sloping? Briefly explain your answer.

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
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| 考試科目 | 經濟學 | 所別 | 商院共同科 | 考試時間 | 2月27日（六）第1節 |
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3. Suppose in an economy, the autonomous consumption equals 100, the marginal propensity to consume equals 0.8, the net taxes are fixed at 100, the planned private-sector investment is fixed at 100, the government purchases are fixed at 100, and the net exports are fixed at 100. Answer the following questions.

a. (10 points) What is the equilibrium output in this economy?

b. (10 points) Suppose the government increases its expenditure to 200, which is financed by the fixed taxes. What is the equilibrium output in this economy?

4. In the summer of 1986 the *Economist* magazine conducted an extensive survey on the prices of Big Mac hambergers at McDonald's restaurants throughout the world. Since then it has periodically updated its calculations. The following table reproduces the results of the *Economist's* January 2015 survey report with slight modification to make the calculation easier.

| Country | Price of a Big Mac | Predicted Exchange Rate | Actual Exchange Rate |
|---|---|---|---|
| Taiwan | 80 NTD | _____ NTD/USD | 32 NTD/USD |
| Japan | 360 JPY | _____ JPY/USD | 120 JPY/USD |
| USA | 4.8 USD | 1 USD/USD | 1 USD/USD |

a. (6 points) Suppose that purchasing power parity (PPP) holds. For Taiwan and Japan, compute the predicted exchange rate of local currency per U.S. dollar.

b. (4 points) According to PPP, what is the predicted exchange rate between the Japanese Yen and the New Taiwan Dollar? What is the actual exchange rate?

c. (4 points) Given the actual nominal exchange rate, what is the real exchange rate between Japan and Taiwan?

d. (6 points) Suppose that the actual exchange rate between Japan and Taiwan will converge to the PPP predicted exchange rate over the next ten years. Which of these two countries will experience a higher rate of inflation over this period? Which coutry will likely have a higher nominal interest rate? Why?

| 備註 | 一、作答於試題上者，不予計分。<br>二、試題請隨卷繳交。 |
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