4/116 **2804E456** Candidate's Seat No :_____

**IM.B.A. in (BI/APR) (NEP) Sem.-4 Examination**

**BM/BI/APR - DSC-M-STAT-244**

**Statistics-II**

**Time : 2-00 Hours]** **April-2025** **[Max. Marks : 50**

**Instructions** :(1) This paper contains **Five** questions.
(2) All questions are compulsory.
(3) Question No.**1,2, 3, 4** have internal options.
(4) Figures in the right side in parenthesis indicate marks.

**Q:1** Define standard normal distribution. State its properties. **(10)**

**OR**

**Q:1** According to the U.S. Department of Labor, the average American household spends $639 on household supplies per year. Suppose annual expenditures on household supplies per household are uniformly distributed between the values of $253 and $1,025. **(10)**

a) What are the standard deviation and the height of this distribution?
b) What proportion of households spend more than $850 per year on household supplies?
c) What proportion of households spend more than $1,200 per year on household supplies?
d) What proportion of households spend between $350 and $480 on household supplies?

**Q:2** Explain in detail point estimation. **(10)**

**OR**

**Q:2** (A) A random sample of 110 cars rented in California reveals that the sample mean travel distance per day is 85.5 miles, with a sample standard deviation of 19.3 miles. Compute a 99% confidence interval to estimate $\mu$. **(05)**

(B) A bank officer wants to determine the amount of the average total monthly deposits per customer at the bank. He believes an estimate of this average amount using a confidence interval is sufficient. How large a sample should he take to be within $200 of the actual average with 99% confidence? He assumes the standard deviation of total monthly deposits for all cutomers is about $1,000. **(05)**



(P.T.O)

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**Q:3** (A) Explain Type-I error and Type-II error. **(05)**

(B) According to a study several years ago by the Personal Communications Industry Association, the average wireless phone user earns $62,600 per year. Suppose a researcher believes that the average annual earnings of a wireless phone user are higher now, and he sets up a study in an attempt to prove his theory. He randomly samples 48 wireless phone users and finds out that the average annual salary for this sample is $64,820, with a standard deviation of $7810. Use $\alpha = 0.01$ to test the researcher's theory. **(05)**

**OR**

**Q:3** A hole-punch machine is set to punch a hole 1.84 centimeters in diameter in a strip of sheet metal in a manufacturing process. The strip of metal is then creased and sent on to the next phase of production, where a metal rod is slipped through the hole. It is important that the hole be punched to the specified diameter of 1.84 cm. To test punching accuracy, technicians have randomly sampled 12 punched holes and measured the diameters. The data (in centimeters) follow. Use an alpha of .10 to determine whether the holes are being punched an average of 1.84 cen-timeters. Assume the punched holes are normally distributed in the population. **(10)**

| | | | |
|---|---|---|---|
| 1.81 | 1.89 | 1.86 | 1.83 |
| 1.85 | 1.82 | 1.87 | 1.85 |
| 1.84 | 1.86 | 1.88 | 1.85 |

**Q:4** A company's auditor believes the per diem cost in Nashville, Tennessee, rose significantly between 1992 and 1999. To test this belief, the auditor samples 51 business trips from the company's records for 1992; the sample average was $190 per day, with a sample standard deviation of $18.50. The auditor selects a second random sample of 47 business trips from the company's records for 1999; the sample average was $198 per day, with a standard deviation of $15.60. If he uses $\alpha = 0.01$, does the auditor find that the per diem average expense in Nashville has gone up significantly? **(10)**

**OR**

**Q:4** Eleven employees were put under the care of the company nurse because of high cholesterol readings. The nurse lectured them on the dangers of this condition and put them on a new diet. Shown are the cholesterol readings of the 11 employees both before the new diet and one month after use of the diet began. Construct a 98% confidence interval to estimate the population mean difference of cholesterol readings for people who are involved in this program. Assume differences in cholesterol readings are normally distributed in the population. **(10)**

| Employee | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Before | 255 | 230 | 290 | 242 | 300 | 250 | 215 | 230 | 225 | 219 | 236 |
| After | 197 | 225 | 215 | 215 | 240 | 235 | 190 | 240 | 200 | 203 | 223 |

**Q:5** **Do as Directed. (Any TEN)** **(10)**

i. Define Type-II Error.
ii. What is the criteria for the acceptance of the null hypothesis?
iii. For a normal distribution, the estimated value of quartile deviation is 12. Find the value of standard distribution.
iv. State the mean of uniform distribution.
v. State the meaning of large sample and small sample.
vi. What is the value of Z at 1% level of significance?
vii. Define sample.
viii. State the parameters of the normal distribution.
ix. If the sample size is greater than 30, which test is generally preferred, Z or t?
x. What does "degrees of freedom" mean in a T-test?
xi. What is the first step in hypothesis testing?
xii. What does "margin of error" represent in a confidence interval?

(P.T.O)

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## t Distribution: Critical Values of t

| *Degrees of freedom* | *Two-tailed test:* / *One-tailed test:* | *Significance level* 10% / 5% | 5% / 2.5% | 2% / 1% | 1% / 0.5% | 0.2% / 0.1% | 0.1% / 0.05% |
|---|---|---|---|---|---|---|---|
| 1 | | 6.314 | 12.706 | 31.821 | 63.657 | 318.309 | 636.619 |
| 2 | | 2.920 | 4.303 | 6.965 | 9.925 | 22.327 | 31.599 |
| 3 | | 2.353 | 3.182 | 4.541 | 5.841 | 10.215 | 12.924 |
| 4 | | 2.132 | 2.776 | 3.747 | 4.604 | 7.173 | 8.610 |
| 5 | | 2.015 | 2.571 | 3.365 | 4.032 | 5.893 | 6.869 |
| 6 | | 1.943 | 2.447 | 3.143 | 3.707 | 5.208 | 5.959 |
| 7 | | 1.894 | 2.365 | 2.998 | 3.499 | 4.785 | 5.408 |
| 8 | | 1.860 | 2.306 | 2.896 | 3.355 | 4.501 | 5.041 |
| 9 | | 1.833 | 2.262 | 2.821 | 3.250 | 4.297 | 4.781 |
| 10 | | 1.812 | 2.228 | 2.764 | 3.169 | 4.144 | 4.587 |
| 11 | | 1.796 | 2.201 | 2.718 | 3.106 | 4.025 | 4.437 |
| 12 | | 1.782 | 2.179 | 2.681 | 3.055 | 3.930 | 4.318 |
| 13 | | 1.771 | 2.160 | 2.650 | 3.012 | 3.852 | 4.221 |
| 14 | | 1.761 | 2.145 | 2.624 | 2.977 | 3.787 | 4.140 |
| 15 | | 1.753 | 2.131 | 2.602 | 2.947 | 3.733 | 4.073 |
| 16 | | 1.746 | 2.120 | 2.583 | 2.921 | 3.686 | 4.015 |
| 17 | | 1.740 | 2.110 | 2.567 | 2.898 | 3.646 | 3.965 |
| 18 | | 1.734 | 2.101 | 2.552 | 2.878 | 3.610 | 3.922 |
| 19 | | 1.729 | 2.093 | 2.539 | 2.861 | 3.579 | 3.883 |
| 20 | | 1.725 | 2.086 | 2.528 | 2.845 | 3.552 | 3.850 |
| 21 | | 1.721 | 2.080 | 2.518 | 2.831 | 3.527 | 3.819 |
| 22 | | 1.717 | 2.074 | 2.508 | 2.819 | 3.505 | 3.792 |
| 23 | | 1.714 | 2.069 | 2.500 | 2.807 | 3.485 | 3.768 |
| 24 | | 1.711 | 2.064 | 2.492 | 2.797 | 3.467 | 3.745 |
| 25 | | 1.708 | 2.060 | 2.485 | 2.787 | 3.450 | 3.725 |
| 26 | | 1.706 | 2.056 | 2.479 | 2.779 | 3.435 | 3.707 |
| 27 | | 1.703 | 2.052 | 2.473 | 2.771 | 3.421 | 3.690 |
| 28 | | 1.701 | 2.048 | 2.467 | 2.763 | 3.408 | 3.674 |
| 29 | | 1.699 | 2.045 | 2.462 | 2.756 | 3.396 | 3.659 |
| 30 | | 1.697 | 2.042 | 2.457 | 2.750 | 3.385 | 3.646 |
| 32 | | 1.694 | 2.037 | 2.449 | 2.738 | 3.365 | 3.622 |
| 34 | | 1.691 | 2.032 | 2.441 | 2.728 | 3.348 | 3.601 |
| 36 | | 1.688 | 2.028 | 2.434 | 2.719 | 3.333 | 3.582 |
| 38 | | 1.686 | 2.024 | 2.429 | 2.712 | 3.319 | 3.566 |
| 40 | | 1.684 | 2.021 | 2.423 | 2.704 | 3.307 | 3.551 |
| 42 | | 1.682 | 2.018 | 2.418 | 2.698 | 3.296 | 3.538 |
| 44 | | 1.680 | 2.015 | 2.414 | 2.692 | 3.286 | 3.526 |
| 46 | | 1.679 | 2.013 | 2.410 | 2.687 | 3.277 | 3.515 |
| 48 | | 1.677 | 2.011 | 2.407 | 2.682 | 3.269 | 3.505 |
| 50 | | 1.676 | 2.009 | 2.403 | 2.678 | 3.261 | 3.496 |
| 60 | | 1.671 | 2.000 | 2.390 | 2.660 | 3.232 | 3.460 |
| 70 | | 1.667 | 1.994 | 2.381 | 2.648 | 3.211 | 3.435 |
| 80 | | 1.664 | 1.990 | 2.374 | 2.639 | 3.195 | 3.416 |
| 90 | | 1.662 | 1.987 | 2.368 | 2.632 | 3.183 | 3.402 |
| 100 | | 1.660 | 1.984 | 2.364 | 2.626 | 3.174 | 3.390 |
| 120 | | 1.658 | 1.980 | 2.358 | 2.617 | 3.160 | 3.373 |
| 150 | | 1.655 | 1.976 | 2.351 | 2.609 | 3.145 | 3.357 |
| 200 | | 1.653 | 1.972 | 2.345 | 2.601 | 3.131 | 3.340 |
| 300 | | 1.650 | 1.968 | 2.339 | 2.592 | 3.118 | 3.323 |
| 400 | | 1.649 | 1.966 | 2.336 | 2.588 | 3.111 | 3.315 |
| 500 | | 1.648 | 1.965 | 2.334 | 2.586 | 3.107 | 3.310 |
| 600 | | 1.647 | 1.964 | 2.333 | 2.584 | 3.104 | 3.307 |
| ∞ | | 1.645 | 1.960 | 2.326 | 2.576 | 3.090 | 3.291 |