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# Daffodil International University

**Department of Software Engineering**
**Faculty of Science & Information Technology**
**Final Examination, Summer 2025**
**Course Code: STA 101; Course Title: Statistics I**
**Sections & Teachers: TBN (42_A-42_D,42_J); AS (42_E-42_H); TK (42_I)**

**Time: 2:00 Hrs** **Marks: 40**

## Answer ALL Questions

***[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]***

| | | | Marks | CLOs |
|---|---|---|---|---|
| **1.** | | The following table contains the information on the amount of time (hours) that each 10 students spend each day on social networks and their GPA. | | |

| Time | 4.4 | 6.2 | 4.2 | 1.6 | 4.7 | 5.4 | 1.3 | 2.1 | 6.1 | 3.3 |
|---|---|---|---|---|---|---|---|---|---|---|
| GPA | 3.22 | 2.21 | 3.13 | 3.69 | 2.7 | 2.2 | 3.69 | 3.25 | 2.66 | 2.89 |

| | | | | |
|---|---|---|---|---|
| | *a)* | **Construct** a scatter diagram for these data. **Analyze** the scatter diagram to determine whether a linear relationship exists between social-networking time and GPA. | 2 | **CLO-2** ***Level-3*** |
| | *b)* | **Compute** the least square estimates and construct the estimated regression equation and interpret your findings. | 3 | |
| **2.** | *a)* | In a city, the temperature is normally distributed with mean of 98.6°F and standard deviation of 0.73°F.<br>i. **Determine** the probability for a daily temperature of 102.9°F.<br>ii. **Calculate** the following probability: P (between 98°F and 99°F) | 2+3=5 | |
| | *b)* | A software company claims that their new debugging tool reduces the average number of bugs per 1000 lines of code to less than 8. Historically, the bug rate was stable with a population standard deviation of 2.4 bugs. A random sample of 45 software modules developed using the new tool shows a mean of 7.3 bugs per 1000 lines.<br><br>**Investigate** whether the new debugging tool significantly reduces the bug rate using the Z-test at the 0.05 level of significance.<br><br>(Use the appropriate statistical procedure to: Formulate the hypotheses, Calculate the test statistic, compare it with the critical value, Interpret the result in context) | 5 | **CLO-3** ***Level-3*** |
| | *c)* | A project manager believes that a new agile training program improves team productivity, such that the average number of user stories completed in a sprint exceeds 25 stories. A sample of 12 teams trained under the program completed an average of 27.1 stories, with a sample standard deviation of 3.2. | 5 | |

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**Investigate** whether the manager's belief is true at the 0.05 significance level applying the t-test procedure.

(Use the appropriate statistical procedure to: Formulate the hypotheses, Calculate the test statistic, compare it with the critical value, Interpret the result in context)

**3. a)** A software company tracked 80 bugs in a month, categorized by severity and module.

| Severity / Module | Frontend | Backend | Total |
|---|---|---|---|
| **Critical** | 12 | 18 | 30 |
| **Minor** | 28 | 22 | 50 |
| **Total** | 40 | 40 | 80 |

Using the contingency table of bug reports:

i. **Identify** the probability that a bug is critical.
ii. **Identify** the probability that a bug is from the backend and critical.
iii. **Identify** the probability that a bug is critical or it is from the frontend.
iv. **Identify** the probability that a bug is minor given that it is from the frontend.
v. **Figure out** whether the events "bug is critical" and "bug is minor" independent?

**10**

**b)** A hospital researcher is interested in the number of times the average post-op patient will ring the nurse during a 12-hour shift. The following table lists the frequency distribution of a random sample of 50 patients.

| X | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| f | 4 | 8 | 16 | 14 | 6 | 2 |

i. **Explore** a probability distribution function (PDF) for X and calculate the Mean and Standard deviation of X.
ii. **Identify** the following probabilities: $P(X \geq 3)$, $P(2 \leq X \leq 4)$

**5**

**CLO-4**
***Level-4***

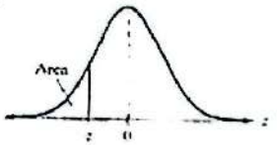
**c)** A software development team is testing a newly developed module. Based on historical data, they know that the probability of a test case passing is 0.9. They plan to run 10 independent test cases to assess the module's reliability.

i. **Identify** the Probability of Exactly 8 Passing Test Cases.
ii. **Explore** the Mean and Variance of Passing Test Cases.

**5**

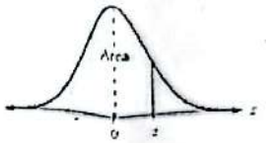
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## Table 4—Standard Normal Distribution




| z | .09 | .08 | .07 | .06 | .05 | .04 | .03 | .02 | .01 | .00 |
|---|---|---|---|---|---|---|---|---|---|---|
| −3.4 | .0002 | .0003 | .0003 | .0003 | .0003 | .0003 | .0003 | .0003 | .0003 | .0003 |
| −3.3 | .0003 | .0004 | .0004 | .0004 | .0004 | .0004 | .0004 | .0005 | .0005 | .0005 |
| −3.2 | .0005 | .0005 | .0005 | .0006 | .0006 | .0006 | .0006 | .0006 | .0007 | .0007 |
| −3.1 | .0007 | .0007 | .0008 | .0008 | .0008 | .0008 | .0009 | .0009 | .0009 | .0010 |
| −3.0 | .0010 | .0010 | .0011 | .0011 | .0011 | .0012 | .0012 | .0013 | .0013 | .0013 |
| −2.9 | .0014 | .0014 | .0015 | .0015 | .0016 | .0016 | .0017 | .0018 | .0018 | .0019 |
| −2.8 | .0019 | .0020 | .0021 | .0021 | .0022 | .0023 | .0023 | .0024 | .0025 | .0026 |
| −2.7 | .0026 | .0027 | .0028 | .0029 | .0030 | .0031 | .0032 | .0033 | .0034 | .0035 |
| −2.6 | .0036 | .0037 | .0038 | .0039 | .0040 | .0041 | .0043 | .0044 | .0045 | .0047 |
| −2.5 | .0048 | .0049 | .0051 | .0052 | .0054 | .0055 | .0057 | .0059 | .0060 | .0062 |
| −2.4 | .0064 | .0066 | .0068 | .0069 | .0071 | .0073 | .0075 | .0078 | .0080 | .0082 |
| −2.3 | .0084 | .0087 | .0089 | .0091 | .0094 | .0096 | .0099 | .0102 | .0104 | .0107 |
| −2.2 | .0110 | .0113 | .0116 | .0119 | .0122 | .0125 | .0129 | .0132 | .0136 | .0139 |
| −2.1 | .0143 | .0146 | .0150 | .0154 | .0158 | .0162 | .0166 | .0170 | .0174 | .0179 |
| −2.0 | .0183 | .0188 | .0192 | .0197 | .0202 | .0207 | .0212 | .0217 | .0222 | .0228 |
| −1.9 | .0233 | .0239 | .0244 | .0250 | .0256 | .0262 | .0268 | .0274 | .0281 | .0287 |
| −1.8 | .0294 | .0301 | .0307 | .0314 | .0322 | .0329 | .0336 | .0344 | .0351 | .0359 |
| −1.7 | .0367 | .0375 | .0384 | .0392 | .0401 | .0409 | .0418 | .0427 | .0436 | .0446 |
| −1.6 | .0455 | .0465 | .0475 | .0485 | .0495 | .0505 | .0516 | .0526 | .0537 | .0548 |
| −1.5 | .0559 | .0571 | .0582 | .0594 | .0606 | .0618 | .0630 | .0643 | .0655 | .0668 |
| −1.4 | .0681 | .0694 | .0708 | .0721 | .0735 | .0749 | .0764 | .0778 | .0793 | .0808 |
| −1.3 | .0823 | .0838 | .0853 | .0869 | .0885 | .0901 | .0918 | .0934 | .0951 | .0968 |
| −1.2 | .0985 | .1003 | .1020 | .1038 | .1056 | .1075 | .1093 | .1112 | .1131 | .1151 |
| −1.1 | .1170 | .1190 | .1210 | .1230 | .1251 | .1271 | .1292 | .1314 | .1335 | .1357 |
| −1.0 | .1379 | .1401 | .1423 | .1446 | .1469 | .1492 | .1515 | .1539 | .1562 | .1587 |
| −0.9 | .1611 | .1635 | .1660 | .1685 | .1711 | .1736 | .1762 | .1788 | .1814 | .1841 |
| −0.8 | .1867 | .1894 | .1922 | .1949 | .1977 | .2005 | .2033 | .2061 | .2090 | .2119 |
| −0.7 | .2148 | .2177 | .2206 | .2236 | .2266 | .2296 | .2327 | .2358 | .2389 | .2420 |
| −0.6 | .2451 | .2483 | .2514 | .2546 | .2578 | .2611 | .2643 | .2676 | .2709 | .2743 |
| −0.5 | .2776 | .2810 | .2843 | .2877 | .2912 | .2946 | .2981 | .3015 | .3050 | .3085 |
| −0.4 | .3121 | .3156 | .3192 | .3228 | .3264 | .3300 | .3336 | .3372 | .3409 | .3446 |
| −0.3 | .3483 | .3520 | .3557 | .3594 | .3632 | .3669 | .3707 | .3745 | .3783 | .3821 |
| −0.2 | .3859 | .3897 | .3936 | .3974 | .4013 | .4052 | .4090 | .4129 | .4168 | .4207 |
| −0.1 | .4247 | .4286 | .4325 | .4364 | .4404 | .4443 | .4483 | .4522 | .4562 | .4602 |
| −0.0 | .4641 | .4681 | .4721 | .4761 | .4801 | .4840 | .4880 | .4920 | .4960 | .5000 |

## Table 4—Standard Normal Distribution *(continued)*




| z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | .5000 | .5040 | .5080 | .5120 | .5160 | .5199 | .5239 | .5279 | .5319 | .5359 |
| 0.1 | .5398 | .5438 | .5478 | .5517 | .5557 | .5596 | .5636 | .5675 | .5714 | .5753 |
| 0.2 | .5793 | .5832 | .5871 | .5910 | .5948 | .5987 | .6026 | .6064 | .6103 | .6141 |
| 0.3 | .6179 | .6217 | .6255 | .6293 | .6331 | .6368 | .6406 | .6443 | .6480 | .6517 |
| 0.4 | .6554 | .6591 | .6628 | .6664 | .6700 | .6736 | .6772 | .6808 | .6844 | .6879 |
| 0.5 | .6915 | .6950 | .6985 | .7019 | .7054 | .7088 | .7123 | .7157 | .7190 | .7224 |
| 0.6 | .7257 | .7291 | .7324 | .7357 | .7389 | .7422 | .7454 | .7486 | .7517 | .7549 |
| 0.7 | .7580 | .7611 | .7642 | .7673 | .7704 | .7734 | .7764 | .7794 | .7823 | .7852 |
| 0.8 | .7881 | .7910 | .7939 | .7967 | .7995 | .8023 | .8051 | .8078 | .8106 | .8133 |
| 0.9 | .8159 | .8186 | .8212 | .8238 | .8264 | .8289 | .8315 | .8340 | .8365 | .8389 |
| 1.0 | .8413 | .8438 | .8461 | .8485 | .8508 | .8531 | .8554 | .8577 | .8599 | .8621 |
| 1.1 | .8643 | .8665 | .8686 | .8708 | .8729 | .8749 | .8770 | .8790 | .8810 | .8830 |
| 1.2 | .8849 | .8869 | .8888 | .8907 | .8925 | .8944 | .8962 | .8980 | .8997 | .9015 |
| 1.3 | .9032 | .9049 | .9066 | .9082 | .9099 | .9115 | .9131 | .9147 | .9162 | .9177 |
| 1.4 | .9192 | .9207 | .9222 | .9236 | .9251 | .9265 | .9279 | .9292 | .9306 | .9319 |
| 1.5 | .9332 | .9345 | .9357 | .9370 | .9382 | .9394 | .9406 | .9418 | .9429 | .9441 |
| 1.6 | .9452 | .9463 | .9474 | .9484 | .9495 | .9505 | .9515 | .9525 | .9535 | .9545 |
| 1.7 | .9554 | .9564 | .9573 | .9582 | .9591 | .9599 | .9608 | .9616 | .9625 | .9633 |
| 1.8 | .9641 | .9649 | .9656 | .9664 | .9671 | .9678 | .9686 | .9693 | .9699 | .9706 |
| 1.9 | .9713 | .9719 | .9726 | .9732 | .9738 | .9744 | .9750 | .9756 | .9761 | .9767 |
| 2.0 | .9772 | .9778 | .9783 | .9788 | .9793 | .9798 | .9803 | .9808 | .9812 | .9817 |
| 2.1 | .9821 | .9826 | .9830 | .9834 | .9838 | .9842 | .9846 | .9850 | .9854 | .9857 |
| 2.2 | .9861 | .9864 | .9868 | .9871 | .9875 | .9878 | .9881 | .9884 | .9887 | .9890 |
| 2.3 | .9893 | .9896 | .9898 | .9901 | .9904 | .9906 | .9909 | .9911 | .9913 | .9916 |
| 2.4 | .9918 | .9920 | .9922 | .9925 | .9927 | .9929 | .9931 | .9932 | .9934 | .9936 |
| 2.5 | .9938 | .9940 | .9941 | .9943 | .9945 | .9946 | .9948 | .9949 | .9951 | .9952 |
| 2.6 | .9953 | .9955 | .9956 | .9957 | .9959 | .9960 | .9961 | .9962 | .9963 | .9964 |
| 2.7 | .9965 | .9966 | .9967 | .9968 | .9969 | .9970 | .9971 | .9972 | .9973 | .9974 |
| 2.8 | .9974 | .9975 | .9976 | .9977 | .9977 | .9978 | .9979 | .9979 | .9980 | .9981 |
| 2.9 | .9981 | .9982 | .9982 | .9983 | .9984 | .9984 | .9985 | .9985 | .9986 | .9986 |
| 3.0 | .9987 | .9987 | .9987 | .9988 | .9988 | .9989 | .9989 | .9989 | .9990 | .9990 |
| 3.1 | .9990 | .9991 | .9991 | .9991 | .9992 | .9992 | .9992 | .9992 | .9993 | .9993 |
| 3.2 | .9993 | .9993 | .9994 | .9994 | .9994 | .9994 | .9994 | .9995 | .9995 | .9995 |
| 3.3 | .9995 | .9995 | .9995 | .9996 | .9996 | .9996 | .9996 | .9996 | .9996 | .9997 |
| 3.4 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9998 |

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Table-3: t-Distribution

| | Level of confidence, c | 0.50 | 0.80 | 0.90 | 0.95 | 0.98 | 0.99 |
|---|---|---|---|---|---|---|---|
| | One tail, $\alpha$ | 0.25 | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 |
| d.f. | Two tails, $\alpha$ | 0.50 | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 |
| 1 | | 1.000 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 |
| 2 | | .816 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 |
| 3 | | .765 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 |
| 4 | | .741 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 |
| 5 | | .727 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 |
| 6 | | .718 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 |
| 7 | | .711 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 |
| 8 | | .706 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 |
| 9 | | .703 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 |
| 10 | | .700 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 |
| 11 | | .697 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 |
| 12 | | .695 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 |
| 13 | | .694 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 |
| 14 | | .692 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 |
| 15 | | .691 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 |
| 16 | | .690 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 |
| 17 | | .689 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 |
| 18 | | .688 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 |
| 19 | | .688 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 |
| 20 | | .687 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 |
| 21 | | .686 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 |
| 22 | | .686 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 |
| 23 | | .685 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 |
| 24 | | .685 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 |
| 25 | | .684 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 |
| 26 | | .684 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 |
| 27 | | .684 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 |
| 28 | | .683 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 |
| 29 | | .683 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 |
| $\infty$ | | .674 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 |

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