



UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

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|------------------|--------------------|
| COURSE CODE | : FGE 1133 |
| COURSE | : BASIC STATISTICS |
| SEMESTER/SESSION | : 2-2024/2025 |
| DURATION | : 3 HOURS |

Instructions:

1. This booklet contains **10** questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 9 PRINTED PAGES INCLUDING COVER PAGE

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

The following are the ages of the 10 people in the video arcade at the Southwyck Shopping Mall at 10 am this morning. Using these data as a sample, compute the following descriptive statistics.

| | | | | | | | | | |
|----|---|----|---|----|----|---|----|----|---|
| 12 | 8 | 17 | 6 | 11 | 14 | 8 | 17 | 10 | 8 |
|----|---|----|---|----|----|---|----|----|---|

- a) Mean (2 marks)
b) Range (2 marks)
c) IQR (2 marks)

QUESTION 2

The following is the frequency distribution summarizes the weights of 200 fish caught by anglers participating in a professional bass fishing tournament.

| Weight (In kg) | Frequency |
|-------------------|-----------|
| 1-3 | 53 |
| 4-6 | 118 |
| 7-9 | 21 |
| 10-12 | 3 |
| 13-15 | 5 |

Find:

- a) The mean of the weight of fish caught. (3 marks)
b) The standard deviation and mode of the weight of fish caught. (6 marks)
c) The Pearson coefficient skewness. (2 marks)

QUESTION 3

A random sample of the employees of the Hardware Manufacturing Company was chosen to determine their retirement plans after age 60. Those selected in the sample were divided into management and production. The result was:

| Employee | Plan after Age 60 | |
|---------------------|-------------------|---------------------|
| | Retire (R) | Not Retire (R') |
| Management (M) | 5 | 15 |
| Production (M') | 30 | 50 |

- a) Develop a joint probability table for these data. (3 marks)
- b) Find $P(R)$ (1 mark)
- c) Find $P(R \cap M')$ (1 mark)
- d) Find $P(R|M)$ (3 marks)
- e) Is event R and M' are independent? (2 marks)

QUESTION 4

Given the universal set, $\xi = \{a, b, c, d, e, f, g\}$, $P = \{a, b, c\}$ and $Q = \{b, c, d\}$. On a Venn diagram, shade the region and list the elements for:

- a) $P \cap Q$ (3 marks)
- b) $P \cap Q'$ (3 marks)

QUESTION 5

There are five sales representatives at Mid-Motors Ford. The five representatives and the number of cars they sold last week given below. Random samples of size 2 are drawn without replacement.

| Sales Representative | Cars Sold |
|----------------------|-----------|
| Peter | 8 |
| Connie | 6 |
| Ron | 4 |
| Ted | 10 |
| Meggie | 6 |

- a) Compute the population mean, μ and standard deviation, σ . (4 marks)
- b) Find the sampling distribution (probability distribution) for the sample \bar{x} . (5 marks)
- c) Compute the mean, $\mu_{\bar{x}}$ and standard deviation, $\sigma_{\bar{x}}$ of \bar{x} . (4 marks)
- d) Compare the mean and standard deviation of the sampling distribution $\mu_{\bar{x}}, \sigma_{\bar{x}}$ with μ and σ . (2 marks)

QUESTION 6

A bank manager has developed a new system to reduce the time customers spend waiting for teller service during peak hours. The manager hopes the new system will reduce waiting times from the current 9 to 10 minutes to less than 6 minutes. A random sample of 100 waiting time yields a sample mean of $\bar{x} = 5.46$ minutes and sample standard deviation $s = 2.47$ minutes. Does this support the claim that the mean waiting time under the new system is shorter than six minutes? Use $\alpha = 0.05$ to conduct hypothesis test.

(10 marks)

QUESTION 7

Suppose that a national survey finds that 73% of restaurant employees say that work stress has a negative impact on their personal lives. A random sample of 200 employees of a large restaurant chain find that 141 employees say that work stress has a negative impact on their personal lives. Formulate the null and alternatives hypothesis needed to attempt to provide evidence that the percentage of work-stressed employees for the restaurant chain differs from the national percentage. Use $\alpha = 0.01$ to conduct hypothesis test. (10 marks)

QUESTION 8

The following table shows the density for the discrete random variable X , the number of free refills on coffee orders.

| | | | | |
|--------|-----|-----|-----|-----|
| x | 0 | 1 | 2 | 3 |
| $f(x)$ | 0.3 | 0.4 | k | 0.1 |

Find:

- a) The value of k (3 marks)
- b) $P(X \leq 2)$ (2 marks)
- c) $P(X > 2)$ (1 mark)
- d) $V(X)$ (6 marks)

QUESTION 9

The United States Postal Service reports 95 percent of first-class mail within the same city is delivered within 2 days of the time of mailing. Six letters are randomly sent to different locations. Find the probability:

- a) Exactly five arrive within 2 days using Binomial distribution. (4 marks)
- b) Exactly five arrive within 2 days using the Normal approximation to the Binomial distribution. (4 marks)

QUESTION 10

WNAE, an all-news AM station, finds that the distribution of the lengths of time listeners are tuned to the station follows the normal distribution. The mean of the distribution is 15 minutes and the standard deviation is 3.5 minutes. What is the probability that a particular listener will tune in:

- a) More than 20 minutes? (4 marks)
- b) For 18 minutes or less? (4 marks)
- c) Between 10 and 12 minutes? (4 marks)

-----End of questions-----

FORMULA

| | |
|--|---|
| <p>Range=Largest value-smallest value Range=Upper limit of the last class - lower limit of the first class</p> | <p>Midpoint, $x = \frac{\text{Lower limit} + \text{Upper limit}}{2}$</p> |
| $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$ | $\bar{x} = \frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^n f_i}$ |
| <p>Median, $\tilde{x} = L_m + \left(\frac{\frac{\sum f}{2} - \sum f_{m-1}}{f_m} \right) \times C_m$</p> <p>$L_m$ = Lower bound of median class f_m = Frequency of median class $\sum f_{m-1}$ = Cumulative frequency before median class C_m = Size of median class $\sum f$ = Number of observation /total frequency</p> | <p>Mode, $\hat{x} = L_{mo} + \left(\frac{d_1}{d_1 + d_2} \right) \cdot C_{mo}$</p> <p>$L_{mo}$ = Lower bound of modal class d_1 = Difference between modal class frequency and the previous class frequency. d_2 = Difference between modal class frequency and the next class frequency. C_{mo} = Size of modal class</p> |
| $s^2 = \frac{1}{\sum f - 1} \left(\sum f_i x_i^2 - \frac{(\sum f_i x_i)^2}{\sum f} \right)$ <p>$s = \sqrt{s^2}$</p> | <p>Skewness = $\frac{\text{mean} - \text{mode}}{s \text{ tan dard deviation}}$</p> <p>or</p> <p>Skewness = $\frac{3(\text{mean} - \text{median})}{s \text{ tan dard deviation}}$</p> |
| <p>Interquartile Range, $IQR = Q_3 - Q_1$</p> <p>which the first quartile lies. $Q_1 = L_{Q1} + \left[\frac{\frac{1}{4}N - F_{Q1}}{f_{Q1}} \right] \times C$ $Q_3 = L_{Q3} + \left[\frac{\frac{3}{4}N - F_{Q3}}{f_{Q3}} \right] \times C$</p> <p>$L_{Q1}$ = lower bound of the class in which the first quartile lies. N = total frequency. F_{Q1} = the cummulative frequency before the class in which first quartile lies. f_{Q1} = the frequency of the class in which the first quartile lies.</p> | |
| $P(A) = \frac{n(A)}{n(S)}$ | $P(A B) = \frac{P(A \cap B)}{P(B)}$ |
| $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ | $P(A \cap B) = P(B) \cdot P(A)$ |

FGE 1133 BASIC STATISTICS

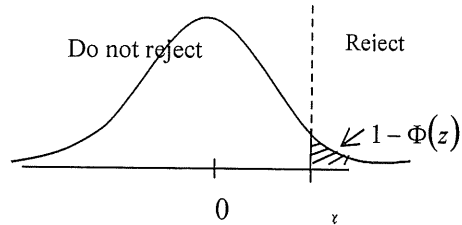
| | |
|--|---|
| $P(A B) = \frac{P(A) \cdot P(B A)}{P(A) \cdot P(B A) + P(A') \cdot P(B A')}$ | $\mu = \frac{\sum x}{N}$ $\mu_{\bar{x}} = \sum \bar{x}P(\bar{x})$ |
| $\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{N}} \quad {}^N C_n \quad N^n$ $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}} \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ | $Z = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \quad T = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$ |
| $Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \quad Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$ | $f(x) = P(X = x) = \binom{n}{x} p^x q^{n-x}$ |
| $f(x) = P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$ | $\mu = E(X) = \sum_{-\infty}^{\infty} x \cdot f(x) = \int_{-\infty}^{\infty} x \cdot f(x) dx$ |
| $E(X^2) = \sum_{-\infty}^{\infty} x^2 \cdot f(x) = \int_{-\infty}^{\infty} x^2 \cdot f(x) dx$ $Var(X) = E(X^2) - [E(X)]^2$ | $Z = \frac{X - \mu}{\sigma} \quad Z = \frac{X - np}{\sqrt{npq}} \quad Z = \frac{X - \lambda}{\sqrt{\lambda}}$ |

APPENDIX I

Table I Standard Normal Distribution

$$1 - \Phi(z) = P(Z > z) = \frac{1}{\sqrt{2\pi}} \int_z^{\infty} e^{-z^2/2} dz$$

$$z = \frac{x - \mu}{\sigma}$$



| z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|-----|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0.0 | .5000 | .4960 | .4920 | .4880 | .4840 | .4801 | .4761 | .4721 | .4681 | .4641 |
| 0.1 | .4602 | .4562 | .4522 | .4483 | .4443 | .4404 | .4364 | .4325 | .4286 | .4247 |
| 0.2 | .4207 | .4168 | .4129 | .4090 | .4052 | .4013 | .3974 | .3936 | .3897 | .3859 |
| 0.3 | .3821 | .3783 | .3745 | .3707 | .3669 | .3632 | .3594 | .3557 | .3520 | .3483 |
| 0.4 | .3446 | .3409 | .3372 | .3336 | .3300 | .3264 | .3228 | .3192 | .3156 | .3121 |
| 0.5 | .3085 | .3050 | .3015 | .2981 | .2946 | .2912 | .2877 | .2843 | .2810 | .2776 |
| 0.6 | .2743 | .2709 | .2676 | .2643 | .2611 | .2578 | .2546 | .2514 | .2483 | .2451 |
| 0.7 | .2420 | .2389 | .2358 | .2327 | .2296 | .2266 | .2236 | .2206 | .2177 | .2148 |
| 0.8 | .2119 | .2090 | .2061 | .2033 | .2005 | .1977 | .1949 | .1922 | .1894 | .1867 |
| 0.9 | .1841 | .1814 | .1788 | .1762 | .1736 | .1711 | .1685 | .1660 | .1635 | .1611 |
| 1.0 | .1587 | .1562 | .1539 | .1515 | .1492 | .1469 | .1446 | .1423 | .1401 | .1379 |
| 1.1 | .1357 | .1335 | .1314 | .1292 | .1271 | .1251 | .1230 | .1210 | .1190 | .1170 |
| 1.2 | .1151 | .1131 | .1112 | .1093 | .1075 | .1056 | .1038 | .1020 | .1003 | .0985 |
| 1.3 | .0968 | .0951 | .0934 | .0918 | .0901 | .0885 | .0869 | .0853 | .0838 | .0823 |
| 1.4 | .0808 | .0793 | .0778 | .0764 | .0749 | .0735 | .0721 | .0708 | .0694 | .0681 |
| 1.5 | .0668 | .0655 | .0643 | .0630 | .0618 | .0606 | .0594 | .0582 | .0571 | .0559 |
| 1.6 | .0548 | .0537 | .0526 | .0516 | .0505 | .0495 | .0485 | .0475 | .0465 | .0455 |
| 1.7 | .0446 | .0436 | .0427 | .0418 | .0409 | .0401 | .0392 | .0384 | .0375 | .0367 |
| 1.8 | .0359 | .0351 | .0344 | .0336 | .0329 | .0322 | .0314 | .0307 | .0301 | .0294 |
| 1.9 | .0287 | .0281 | .0274 | .0268 | .0262 | .0256 | .0250 | .0244 | .0239 | .0233 |
| 2.0 | .02275 | .02222 | .02169 | .02118 | .02068 | .02018 | .01970 | .01923 | .01876 | .01831 |
| 2.1 | .01786 | .01743 | .01700 | .01659 | .01618 | .01578 | .01539 | .01500 | .01463 | .01426 |
| 2.2 | .01390 | .01355 | .01321 | .01287 | .01255 | .01222 | .01191 | .01160 | .01130 | .01101 |
| 2.3 | .01072 | .01044 | .01017 | .00990 | .00964 | .00939 | .00914 | .00889 | .00866 | .00842 |
| 2.4 | .00820 | .00798 | .00776 | .00755 | .00734 | .00714 | .00695 | .00676 | .00657 | .00639 |
| 2.5 | .00621 | .00604 | .00587 | .00570 | .00554 | .00539 | .00523 | .00508 | .00494 | .00480 |
| 2.6 | .00466 | .00453 | .00440 | .00427 | .00415 | .00402 | .00391 | .00379 | .00368 | .00357 |
| 2.7 | .00347 | .00336 | .00326 | .00317 | .00307 | .00298 | .00289 | .00280 | .00272 | .00264 |
| 2.8 | .00256 | .00248 | .00240 | .00233 | .00226 | .00219 | .00212 | .00205 | .00199 | .00193 |
| 2.9 | .00187 | .00181 | .00175 | .00169 | .00164 | .00159 | .00154 | .00149 | .00144 | .00139 |
| 3.0 | .00135 | .00131 | .00126 | .00122 | .00118 | .00114 | .00111 | .00107 | .00104 | .00100 |
| 3.1 | .00097 | .00094 | .00090 | .00087 | .00084 | .00082 | .00079 | .00076 | .00074 | .00071 |
| 3.2 | .00069 | .00066 | .00064 | .00062 | .00060 | .00058 | .00056 | .00054 | .00052 | .00050 |
| 3.3 | .00048 | .00047 | .00045 | .00043 | .00042 | .00040 | .00039 | .00038 | .00036 | .00035 |
| 3.4 | .00034 | .00032 | .00031 | .00030 | .00029 | .00028 | .00027 | .00026 | .00025 | .00024 |
| 3.5 | .00023 | .00022 | .00022 | .00021 | .00020 | .00019 | .00019 | .00018 | .00017 | .00017 |
| 3.6 | .00016 | .00015 | .00015 | .00014 | .00014 | .00013 | .00013 | .00012 | .00012 | .00011 |
| 3.7 | .000108 | .000104 | .000100 | .000096 | .000092 | .000088 | .000085 | .000082 | .000078 | .000075 |
| 3.8 | .000072 | .000069 | .000067 | .000064 | .000062 | .000059 | .000057 | .000054 | .000052 | .000050 |
| 3.9 | .000048 | .000046 | .000044 | .000042 | .000041 | .000039 | .000037 | .000036 | .000034 | .000033 |
| 4.0 | .000032 | | | | | | | | | |
| 5.0 | → 0.0000002867 | | | | | | | | | |
| 5.5 | → 0.0000000190 | | | | | | | | | |
| 6.0 | → 0.0000000010 | | | | | | | | | |

