PSP 3223: QUANTITATIVE TECHNIQUES FOR PLANNING

BA SPATIAL PLANNING AND B.SC WATER RESOURCES AND ENVIRONMENTAL MANAGEMENT

Question One

a) A manufacturer produces bolts with a thickness of exactly 1inch (purportedly). A customer takes a random sample of 100 bolts and find that $\overline{X}$ =1.2 inches and s = .40 inches. Should the manufacturer's claim, that the bolts are exactly 1 inch (on average) be rejected? Test at α = 0.01. (10 marks)

b) Suppose the National Transportation Safety Board (NTSB) wants to examine the safety of compact cars, midsize cars, and full-size cars. It collects a sample of three for each of the treatments (cars types). Using the hypothetical data provided below, test whether the mean pressure applied to the driver's head during a crash test is equal for each types of car. Use α = 5%.

i. State the null and alternative hypotheses. (2 marks)
ii. Calculate the sum of squares total (SS_T). (2 marks)
iii. Calculate the sum of squares model (SS_M). (2 marks)
iv. Calculate the residual sum of squares (SS_R) (2 marks)
v. Calculate the mean squares (2 marks)
vi. Calculate the F-ratio (2 marks)
vii. Write down the decision criteria (2 marks)
viii. Make your decision (2 marks)

c) Briefly explain, using an example, when to use correlation and regression analysis (4 marks)

Question Two

a) What do you understand by inferential statistics? (10 marks)
b) What do you understand by descriptive statistics? (10 marks)

Question Three

a) Describe the four types of data in statistics? (10 marks)
b) Data cannot be converted from the simplest to most complex. Explain. (5 marks)
c) Explain the relationship between data, information and knowledge (5 marks)

Question Four

a) What is an event in probability? (2.5 marks)
b) Two coins are tossed, find the probability that two heads are obtained. **Note:** Each coin has two possible outcomes H (heads) and T (Tails). (5 marks)
c) Explain your understanding of the following terms:
   i. Mutually exclusive events (2.5 marks)
   ii. Conditional probability (2.5 marks)
   iii. Compound probability (2.5 marks)

d) A pack contains 4 blue, 2 red and 3 black pens. If 2 pens are drawn at random from the pack, NOT replaced and then another pen is drawn. What is the probability of drawing 2 blue pens and 1 black pen? (5 marks)

Question Five

a) Using an example, explain what time series data is? (4 marks)

b) Explain the following concepts in time series components:

i. Trend (4 marks)

ii. Cyclical (4 marks)

iii. Seasonal (4 marks)

iv. Irregular (4 marks)