Sri Lanka Institute of Information Technology

B.Sc. Special Honours Degree/Diploma
in
Information Technology

Mid-Term Examination
Year 2, Semester 1 (2014)

MA220 Probability & Statistics

Duration: 1 Hour

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(Time: .....)

Instruction to Candidates:

- Answer in the paper itself.
- Calculators are allowed.
- Total marks 20.
- This paper contains 4 pages with Cover Page.
- Electronic devices capable of storing and retrieving text, including electronic dictionaries and mobile phones are not allowed.

Part I: 1 mark each [Total marks 10]

1. A coin with P (Head) =0.6 is tossed twice. What is the probability that at least one head occurs?

a) $\frac{3}{4}$
b) $\frac{2}{3}$
c) $\frac{1}{4}$
d) $\frac{1}{3}$
e) None of the above

2. The sample space of the discrete random variable X is $S = \{1,2,3,4\}$. $P(X = x) = \frac{x}{10}$.

What is the probability that $X \geq 3$?

a) $\frac{3}{10}$
b) $\frac{12}{10}$
c) $\frac{9}{10}$
d) $\frac{6}{10}$
e) None of the above

3. The sample mean and the median of the following data are given respectively:

2, 2, 3, 8, 9, 5, 5, 0

a) 0.5, 0.316
b) 0, 0.302
c) 6.5, 0.35
d) 0, 0. 94
e) None of the above

4. If, for a random variable X, we have $E(X) = 3$ and $E(X^2) = 10$, find Var(X).

a) 1
b) 7
c) $\sqrt{6}$
d) $\sqrt{8}$
e) None of the above

5. Suppose that A and B are two events with P(A) = 0.6, P(B) = 0.5 and P(A ∪B) = 0.9. Evaluate P(A ∩ B).

a) 0.1
b) 0.2
c) 0.4
d) 0.3
e) None of the above

6. Two fair dice are rolled. Find the probability that the sum is 10.

a) $\frac{5}{36}$
b) $\frac{1}{18}$
c) $\frac{1}{9}$
d) $\frac{1}{12}$
e) None of the above

7. A garment factory produces large lots of a certain type of garments. What is the mean of the number of defective units found in a sample of 10 units if the lot is 2% defective?

a) 5
b) 2
c) 0.99
d) 3
e) None of the above

8. The statistic NOT required for a box-plot is:

a) Mean
b) 1st quartile
c) Median
d) 2nd quartile
e) None of the above

9. Poisson parameter for arrivals of telephone calls for a period of 1hour is $\lambda = 8$. What is the probability that exactly 4 arrive during a 1-hour period?

a) e^{-8}
b) $e^{-8}12^4$
c) $\frac{e^{-8}4^8}{8!}$
d) $\frac{e^{-8}8^4}{4!}$
e) None of the above

10. In an experiment to study the relationship of hypertension and smoking habits, the following data are collected.

	Nonsmoker	Smoker
Hypertension	21	66
No hypertension	48	45

Find the probability that a randomly chosen person is experiencing hypertension given that the person is a smoker?

a) 0.5
b) 0.59
c) 0.75
d) 0.37
e) None of the above

Part II: 2 marks each. [Total marks 10]

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1. Find $P(A \cap B \cap C)$, assuming $P(A) = 0.3$, $P(B|A) = 0.75$, and $P(C|A \cap B) = 0.20$.

a) 0.16
b) 0.045
c) 0.09
d) 0.5
e) None of the above

2. The probability that a patient recovers from a heart operation is 0.8. What is the probability that exactly 2 of the next 3 patients who have this operation survive?

   (a) 0.384
   (b) 0.667
   (c) 0.025
   (d) 0.500
   (e) None of the above

3. A firm uses 3 hotels to provide overnight accommodation for its clients. It is known that 20% of the clients are assigned rooms at hotel A, 50% hotel B, and 30% at hotel C. If the plumbing is faulty in 5% of the rooms at the hotel A, in 4% of the rooms at the hotel B, and 8% of the rooms at hotel C, what is the probability that a client will be assigned a room with faulty plumbing?

   (a) 0.170
   (b) 0.003
   (c) 0.002
   (d) 0.054
   (e) None of the above

4. If $S = \{x|0 < x < 12\}$, $M = \{x|1 < x < 9\}$, and $N = \{x|0 < x < 5\}$, find $M \cup N$.

   (a) $S = \{x|0 < x < 9\}$
   (b) $S = \{x|0 < x < 5\}$
   (c) $S = \{x|5 < x < 9\}$
   (d) $S = \{x|5 < x < 9\}$
   (e) None of the above

5. A certain agency employs three consulting firms (A, B, and C) with probabilities 0.40, 0.35, and 0.25, respectively. From past experience, it is known that the probabilities of cost overruns for the firms are 0.05, 0.03, and 0.15 respectively. Suppose a cost overrun is experienced by the agency. What is the probability that the consulting firm involved is company C?

   (a) 0.55147
   (b) 0.05
   (c) 0.5
   (d) 0.0375
   (e) None of the above.