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RAJARATA UNIVERSITY OF SRILANKA

FACULTY OF APPLIED SCIENCES, MIHINTALE

B.Sc. (General) Degree

First Year Semester I Examination - October 2014

MAA 1302 – Probability and Statistics I

Answer **Five** Questions Only Time allowed: **Three Hours**

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1. Find the most suitable answers;

i. The heights of a sample of ten people are:

67 73 70 60 67 66 68 71 70 67.

Which are the correct real limits for the frequency table given below?

Frequency	(a)	(b)	(c)
1	60.5-63.5	60-62	59.5-62.5
0	63.5-66.5	63-65	62.5-65.5
5	66.5-69.5	66-68	65.5-68.5
3	69.5-72.5	69-71	68.5-71.5
1	72.5-75.5	72-74	71.5-74.5

a. Column a is correct
b. Column b is correct
c. Column c is correct
d. All of columns a,b,c are correct
e. None of columns a,b,c are correct

ii. For a symmetric distribution, the mean and median are
a. the same
b. always different
c. possibly the same, possibly different
d. insufficient information.

iii. Consider the following data:
1, 7, 3, 3, 6, 4

The mean and median for this data are respectively:

a. 4 and 3 b. 4.8 and 3 c. 4.8 and 7/2 d. 4 and 7/2 e. 4 and 10/3

iv. A distribution of 6 scores has a median of 21. If the highest score increases 3 points, the median will become _____.

a. 21 **b.** 21.5 **c.** 24 **d.** Cannot be determined without additional information. **e.** none of these

v. The sample variance of the following sample of five numbers 1,2,3,4,5 is:

a. 2.5 **b.** 9 **c.** 10 **d.** 13.3 **e.** 55

vi. Suppose that A and B are mutually exclusive such as P(A)= 0.30 and P(B)=0.20.

Which one of the following statement is incorrect?

a. $P(A^c)= 0.70$ **b.** P(A and B)= 0 **c.** P(A/B)=P(B/A)

d. P(A or B)=0.50 **e.** A and B are independent event

2. Following are the wages in rupees of 70 workers,

32	57	102	98	98	57	41	26	94	105
83	67	93	113	128	82	86	114	84	35
118	62	63	68	68	72	136	79	85	75
36	92	73	63	73	92	146	129	102	45
89	117	123	78	92	52	96	24	115	76
40	87	108	98	82	42	66	89	35	84
47	97	63	133	62	46	46	99	125	125

Using equal class widths 23.5—33.5, 33.5—43.5,---- construct a frequency table of values and draw,

i. a histogram,
ii. a frequency polygon,
iii. a cumulative frequency polygon, to represent the distribution.

3.

i. Consider the following frequency distribution of weights of 150 bolts:

Weight (grams)	**Frequency**	**Weight (grams)**	**Frequency**
5.00 and less than 5.01	4	5.05 and less than 5.06	22
5.01 and less than 5.02	18	5.06 and less than 5.07	11
5.02 and less than 5.03	25	5.07 and less than 5.08	3

5.03 and less than 5.04	36	5.08 and less than 5.09	1
5.04 and less than 5.05	30		

Calculate the mean and standard deviation of the weights of bolts to three decimal places.

ii. Let X be a random variable and let a, b, and c be constants. Then for any functions $g_1(x)$ and $g_2(x)$ whose expectations exist. Show that

a. $E(ag_1(X) + bg_2(X) + c) = aEg_1(X) + bEg_2(X) + c$.

b. If $g_1(x) \geq 0$ for all x, then $E(g_1(X)) \geq 0$.

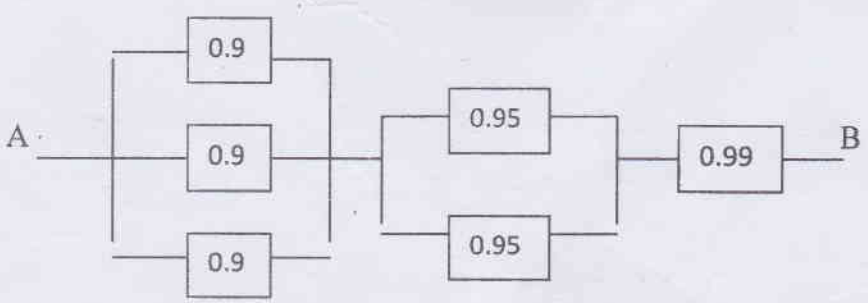
c. If $g_1(x) \geq g_2(x)$ for all x, then $E(g_1(X)) \geq E(g_2(X))$.

d. If $a \leq g_1(x) \leq b$ for all x, then $a \leq Eg_1(X) \leq b$.

4.

i. Suppose a statistics class contains 70% male and 30% female students. It is known that in a test, 5% of males and 10% of females got an "A" grade. If one student from this class is randomly selected and observed to have an "A" grade, what is the probability that this is a male student?

ii. The following circuit operates only if there is a path of functional devices from left to right. The probability that each device functions is shown on the graph. Assume that devices fail independently. What is the probability that the circuit operates?



5.

i. Let the moment generating function $M_X(t)$ be defind by

$M_X(t) = E(e^{xt})$ if Y=$\frac{x-\mu}{\sigma}$, where μ and σ are constants, find $M_y(t)$ in terms of M_X

ii. The moment generating function of a random variable X is givan as $M_X(t) = e^{(3e^t-3)}$. Determine the quantities E(X) and E(X^2).Also find the $Var(X)$.

6.

i. Marksat an examination are assumed to be normally distributed with a mean of 78 a variance 36.

   a. What is the probability that a person taking the examination gets more than 72 marks?

   b. Suppose that a student scoring in the top 10% of this distribution will receive an "A" pass. What is the minimum mark a student must get to obtain an "A" pass?

ii. The length of time required by a student to complete a one hour test is a random variable (X) with density function given by,

F(x) = $c x^2 + x$; $0 \leq x \leq 1$

= 0 ; otherwise. Where c is constant.

   a. Find c

   b. Find F(x), E(x) , Var(x) and median of X.