KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Marks Scored:

Level : B.Sc./B. Pharm./B. Tech.
Year : I

Course : MATH 102
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date SEP 0 8 2017

SECTION "A"
[10Q × 1 = 10 marks]

1. Half of the difference between third quartile and first quartile of data distribution is called _____.

2. If P(A) = 0.6, P(B) = 0.8 and P(A | B) = 0.45, then P(B ∩ A) = _____.

3. For a random variable X, P(X = 0) = 1/8, P(X = 1) = 3/8, P(X = 2) = 3/8 and P(X = 3) = 1/8, then E(X) has value _____.

4. If mean and variance of a B(n, p) distribution are 6 and 4 respectively, then p = _____.

5. If $X \sim N(45, 16)$ then Z = _____ has standard normal distribution N(0, 1).

6. The value of skewness of a normal distribution is equal to _____.

7. If Z has N(0, 1) distribution, then Z^2 has chi-square distribution with _____ degrees of freedom.

8. A medicine company wants to establish that the medicine which it prepared reduces the blood pressure significantly. If μ_1 and μ_2 denote average blood pressure of a sample of randomly selected patients before and after taking the medicine, then the null and alternative hypothesis of the corresponding test are
H_0: _____ and H_1: _____.

9. The value of test statistic that is used to test the null hypothesis whether the population mean is 70 or not on the basis of sample of size 25 having sample mean 74 and sample s.d. 4.2 is _____.

10. In regression analysis, the difference between observed values and corresponding estimated values as given by regression equation is called _____.

SECTION "B"
[10 Q. × 1 = 10 marks]

11. Median is _____
(i) based on all the observations
(ii) rigidly defined
(iii) affected by extreme observations
(iv) middle most part of the distribution

12. If two events are of such type that the occurrence of one guarantees the non-occurrence of another, then the two events are said to be _____
(i) independent events (ii) mutually exclusive events
(iii) equally likely events (iv) dependent events

13. If X is random variable then $P(X \leq x)$ is a non-decreasing function of X. It is denoted by $F_X(x)$ and is called _____.
(i) probability mass function (ii) probability density function
(iii) probability distribution function (iv) cumulative distribution function

14. In which distribution are mean and variance always equal?
_____
(i) Binomial distribution (ii) Poisson distribution
(iii) Hypergeometric distribution (iv) Normal distribution

15. Let V be normal approximation of binomial random variable X, then $P(X \geq 12) =$
_____
(i) $P(V \geq 11.5)$ (ii) $P(V > 11.5)$ (iii) $P(V \leq 12.5)$ (iv) $P(V < 12.5)$

16. The square root of variance of a statistic is called its _____
(i) standard deviation (ii) standard error (iii) mean (iv) median

17. Which of the following expressions give lower confidence interval for population mean when population variance is unknown: _____
i) $P\left(\mu \geq \bar{X} - Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}\right) = 1 - \alpha$ ii) $P\left(\mu \geq \bar{X} + t_{\frac{\alpha}{2}, n-1}\frac{S}{\sqrt{n}}\right) = 1 - \alpha$
iii) $P\left(\mu \geq \bar{X} - t_{\frac{\alpha}{2}, n-1}\frac{S}{\sqrt{n}}\right) = 1 - \alpha$ iv) $P\left(\mu \leq \bar{X} + t_{\frac{\alpha}{2}, n-1}\frac{S}{\sqrt{n}}\right) = 1 - \alpha$

18. In 'Test of hypothesis' studies, Type II error means error committed in
_____
i) rejecting null hypothesis when it is true ii) accepting alternative hypothesis when it is tru
iii) accepting null hypothesis when it is false iv) accepting null hypothesis when it is true

19. In regression analysis, the X-variables are also called _____
i) dependent variables ii) regressor variables
iii) response variables iv) regressive variables

20. If the value of correlation coefficient between two variables is observed to be – 0.9, then it indicates _____
i) weak negative correlation ii) strong negative correlation
iii) perfect negative correlation iv) no correlation

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Semester : II
F. M. : 55

SECTION "C"

[3Q × 7 = 21 marks]

1. What do you mean by conditional probability? State multiplication law of probability for two dependent events.
It was found that 68% of the passengers on a train used a cell phone during their journey. Of those using a cell phone, 70% were under 30 years old, 25% were between 30 and 65 years and rest were over 65 years old. Of those not using a cell phone, 26% were under 30 years, 10% were between 30 and 65 years and rest were over 65 years old. A randomly selected passenger is known to be 45 years old, find probability of this passenger using a cell phone during the journey. [1.5+1.5+4]

2. What are different errors that may be associated with test of hypothesis problems? Following table gives weight of obese female patients before and after being participated in a weight-loss program.

Before	:	117.3	111.4	98.6	104.3	105.4	100.4	81.7	89.5	78.2
After	:	83.3	85.9	75.8	82.9	82.3	77.7	62.7	69.0	63.9

At 5% level of significance, is there any evidence that the weight-loss program has been successful in reducing weight of obese female patients. Also find 90% confidence interval for actual reduction in weight due to the program. [1+4+2]

3. The city council has gathered data on the number of minor traffic accidents and the number of football games that occur in town over a weekend as given below: [2+4+1]

Number of football games	20	30	10	12	15
Number of minor accidents	6	9	4	5	7

(a) Plot these data on graph.
(b) Develop an estimating linear equation of the form $y = \alpha + \beta x$ that best describes these data.
(c) Predict the number of minor traffic accidents that may occur on a weekend during which 33 football games take place in the city.

SECTION "D"

[6 Q. × 4 = 24 marks]

4. A random sample of 30 people recorded the number of glasses of water they drank in a particular week. The results are as follows: 23 19 15 24 18 31 34 24 17 28 28 41 19 34 38 34 41 22 28 19 26 46 27 38 28 35 29 40 25 26
On graph paper draw a box-and-whisker plot.

5. The six faces of a fair cubical dice are numbered 1, 2, 3, 4, 5 and 6. When the dice is thrown once, let X be random variable denoting the number appearing on the top face. Construct probability distribution of X showing different values that may be assumed by X along with corresponding probabilities. Then calculate the variance of the random variable of X.

6. A school car park has 5 parking spaces. A student decides to do a survey to see whether this is enough. At the same time each day, she observes the number of spaces which are filled. Let X be random variable denoting the number of spaces filled at this time on a randomly chosen day. Is it reasonable to model the distribution of X with a binomial distribution? Give any four reasons.

7. Sujan spends the time on his homework each day in term-time has a normal distribution with mean 1.9 hours and standard deviation σ hours. On 80% of these days he spends more than 1.35 hours on his homework. Find the value of σ. Also find the probability that, on a randomly chosen day in term-time, Sujan spends less than 2 hours.

8. Considering the six districts of Koshi zone, namely, Bhojpur, Dhankuta, Morang, Sankhuwasabha, Sunsari and Terhathum as population, if any two districts are to be selected at random without replacement, then enumerate all the possible samples of two districts.

9. Two different lighting techniques are compared by measuring the intensity of light at selected locations in areas lighted by the two methods. If 15 measurements in the first area had a standard deviation of 2.7 foot-candles and 21 measurements in the second area had a standard deviation of 4.2 foot-candles, can it be concluded that the lighting in the second area is less uniform? Use a 0.01 level of significance.

OR

An estimate of the time of continuous use until an answering machine will first require service is desired. If it can be assumed that $\sigma = 72$ days, how large a sample is needed so that one will be able to assert with 95% confidence that the sample mean is off by at most 12 days?

SECTION "E"

[5 Q. × 2 = 10 marks]

10. The number of eggs laid by a hen per week, X, has probability distribution as shown below-

x	2	3	4
P(X = x)	0.1	0.2	0.7

Find E(X).

11. Pharmacy in a clinic has 20 revolizers of which 5 are defective. If 10 of these revolizers are selected at random, find the probability that there are exactly 2 defective units in the sample by using hyper-geometric distribution?

12. The random variable X is normally distributed with mean equal to five times the standard deviation. It is given that $P(X > 20) = 0.0732$. Find the mean.

13. Mention the form of distribution of the following statistics along with respective degrees of freedom:

$$\frac{(n-1)S^2}{\sigma^2}$$

14. The study of a set of paired data on (X, Y) give following results: $\sum x = 15$, $\sum y = 30$, $\sum x^2 = 55$, $\sum y^2 = 226$ and $\sum xy = 110$. Find correlation coefficient between X and Y.