# BA5106 STATISTICS FOR MANAGEMENT

## IMPORTANT QUESTIONS AND QUESTION BANK

### Unit 1 INTRODUCTION

2-Marks

1. Define probability?
2. Define conditional probability?
3. What is the change that a leap year selected at random will contain 53 Sundays?
4. Define random variable?
5. Define binominal distribution?
6. The mean and S.D of a binomial distribution are 5 and 2. Determine the distribution?
7. Define Poisson Distribution?
8. Define uniform or rectangular distribution and write down its properties?
9. Probability mass function?
10. Properties of binominal distribution?
11. Give two uses for probability distributions?
12. Give two examples for conditional probability?
13. State the theorem of total probability?
14. Write the mean and variance of uniform distribution
15. Define statistics?

13-Marks

1. Measurement of probability?
2. Explain the probability rules?
3. Explain the Bayes theorem?
4. Poisson distribution and write down its properties?
5. If x is Poisson variate such that $p(x=1) =$ and $p(x=2)$, =find $p(x=0)$ and $p(x=8)$?
6. Write down difference between binominal and Poisson distribution?
7. X is normally distributed and the mean of x is 12 and the S.D is 4 find the probability of the following?
   1. $x \geq 20$
   2. $x \leq 20$
   3. $0 \leq x \leq 12$?
8. In a bolt factory machines A1, A2, A3 manufacture respectively 25%,35% and 40% of total of their output .in this 5%,4% and 2% are defective bolt a bolt is drawn at random from the product and is found to a defective what are the probability that it was manufacture by machine A1, A2, A3?

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9.  A pair of dies thrown if the two-number appearing be different find the probability that
    1)The sum 6
    2)The sum 5 or loss.

10. A random variable x has the following probability function:

| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| P(x) | a | 3a | 5a | 7a | 9a | 11a | 13a | 15a | 17a |

    1.determine the value of a
    2.find p(x<3); p(x≥3); p(0<x<5)
    3.find the distribution function of f(x)

11. if x is the continuous random variable whose probability density function given by $F(x)=\{c(4x-2x^2)$; $o<x<2$; otherwise.
    1.What is the value OC?
    2.Find P(X>1)

12. Find the mean and variance of binominal distribution?

13. The mean 2 variance of binominal distribution is 8&6, find p(x≥2)?

14. If x is the Poisson variate such that p(x=1) =3/10, p(x=2) =15, find p(x=0) and p(x=3)?

15. x is uniform distribution over (0,10) find the probability that
    1.X<2
    2.X>8
    3.3<x<8

16. A coin is tossed 5 times what are the chances of getting at least two heads? what are the chances of not getting more than 3 tails?

17. There are two boxes A and B.A has three red and five blue balls. B has 5 red and 6 green balls. A ball is drawn at random from box A. what are the chances it is red? Suppose you draw another ball from box A without replacing the original ball, what are the chances it is also red? If a ball is drawn from each box, what are the chances of both being red? Suppose you have drawn a ball from one of the boxes and it happens to be red, what are the chances it is from box B?

18. 1) A bag contain 5 balls and it is not known how many of them are white. Two balls are drawn at random from the bag and they are noted to be white. What is the probability that all the balls in the bag are white?

    2) Derive the mean and variance of Poisson distribution

19. An irregular 6-faced die is such that the probability that it gives 3 even numbers in the 5th throws is twice the probability that it gives 2 even number in 5 throws. How many sets of exactly 5 trails can be expected to give no even number out of 2500 sets?

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20. If the actual amount of instant coffee which a filing machine puts into 6-ounce jar is a RV having a normal distribution with SD=0.05 ounce and if only 3% of the jars are to contain less than 6 ounces of coffee. What must be the mean fill of these jars?

## UNIT-II SAMPLING DISTRIBUTION AND ESTIMATION

2marks

1. Define sampling?
2. What is meant by sampling? List the types of errors?
3. What is sampling error? When it occurs?
4. Give the formulation for calculate of sampling distribution of single mean and difference of two proportions?
5. Give the formulate for calculating of sampling distribution of single proportion and difference of two proportions?
6. An automobile repair shop has taken random sample of 40 services that the average service time on an automobile is 130 minutes with a standard deviation of 26 minutes. Compute the standard error of the mean?
7. Define confidence limit for a parameter?
8. Mention the properties of a good estimation?
9. A population has the numbers:12,8,10,30,12,16,40,5,16,24,22,31,30?
10. Draw a systematic sample of size 5. Find out its mean?
11. How large samples is useful in estimation and testing?
12. Define central limit theorem?
13. Define stratified sampling technique?
14. Define parameter and statistic with example?
15. Define estimator, estimate and estimation?
16. What are samples taken?
17. What is called interval estimation?
18. Define confidence coefficient?
19. What is a random number? How it is useful in sampling?
20. Define probable standard error?

13marks

1. A simple random sample of 144 items resulted in a sample mean of 1257. 85 and a standard deviation of 480. Develop 95% confidence limit for the population mean?
2. A random sample of 700 units from a large consignment should that 200 were damaged. Find:1) 95% confidence limit. 2) 99% confidence limit for the proportion of damaged unit in the consignment?

3. Explain in detail about sampling techniques?

4. Discuss the standard error of proportion?

5. Explain the method of drawing simple random sample from a finite population?

6. From a population of 500 items with a mean of 100 grams and standard deviation of 12.5 grams, 65 items were chosen.

    1)what is the standard error.

    2)find p(99.5<x<101.5)

7. Find the probability that in 500 tosses of fair coin

    1)Between 40% and 60% will be head.

    2)5/8 or more will be heads?

8. Discuss how it is better than simple random sampling in a particular situation?

9. A random sample of size 9 is obtained from a normal population with mean 25 and if the variance 100 find the probability that the sample mean exceeds 31.2?

10. A certain group is studied. As part of the study a sample of 40 students is found to have an average age of 25 with a standard deviation of 1.5. what do you expect the age range of the population to be if you expect 95% confidence levels? If you are to increase the confidence levels to 99%, what will the range of age be?

11. A distribution with unknow mean µ has variance equal to 1.5. use central limit theorem to find how large a sample should be taken from the distribution in order that the probability will be at least 0.95 that the sample mean will be within 0.5 of the population mean.

12. The mean value of a random sample of 60 items was found to be 145 with a SD of 40. Find the 95% confidence limits for the population mean. What size of the sample is required to estimate the population mean within five of its actual value with 95% or more confidence using the sample mean.

13. In a normally distributed population, average income per household is Rs. 20,000 with a standard deviation of Rs. 1,600. Find the probability that the sample mean will be between Rs 19,600 and Rs.20,200 in a survey of a random sample of 100 households.

14. In a sample of 1000 citizen of India, 540 are wheat eaters and the rest are rice eaters. Can we assume that both rice and wheat equally popular in India at 1% level of significance?

15. A firm wishes to estimate with an error of not more than 0.03 and a level of confidence of 98%, the proportion of consumers that prefer its brand of household detergent. Sales report indicate the about 0.20 of all consumers prefer the firm's brand. What is the requisite sample size?

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## UNIT-III TESTING OF HYPOTHESIS- PARAMETRIC TESTS

2-Marks

1. Define null hypothesis and alternative hypothesis with example?
2. What are the type1 and type 2 errors?
3. What do you mean by one tail test?
4. State the application of z-teat and t-test?
5. Define critical region?
6. Distinguish between one tail and two tail tests?
7. Distinguish between one-way and two-way analysis of variance?
8. When you can use z-test?
9. Define the level of significance?
10. What is the difference between small sample test and large sample test?
11. What is the role of standard error?
12. Mention any four applications of t-distribution in tests of hypothesis?
13. Mention any four uses of chi-square distribution in test of hypothesis?
14. Mention any two assumptions made in analysis of variance techniques?
15. Distinguish between a parametric and non-parametric test.
16. Give two examples for a hypothesis
17. State critical value.
18. Write down the format of the ANOVA table for one factor of classification.
19. What is the aim of design of experiments?
20. Write the uses of F-test?

13-Marks

1. Explain the one way and two-way ANOVA table?
2. Use H-test at the 0.05 level of significance to test the null hypothesis that the three methods are equally effective?
3. Discuss the test procedure to test hypothesized population proportion using single sample proportion?
4. Write the application testing of hypothesis in statistics. What is t-test when should we apply a t-test?
5. The following sample was drawn from a normal population 45.60 55 58 42 35 60 65 55 40 test 1% level of significance if the population mean could be 50?
6. Apply ANOVA technique and write your comment regarding the sales (in Rs. Lacs)

| Area | | | | |
|-----------|---|----|----|----|
| Represent |   | 1  | 2  | 3  | 4 |
|           | A | 12 | 16 | 20 | 18 |
|           | B | 15 | 10 | 12 | 16 |
|           | C | 10 | 08 | 16 | 16 |

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7. Three samples below have been obtained from normal population with equal variance test the hypothesis that the means are equal?

Sample 1: 10 12 18 15 16
Sample 2:  7 15 10 12 8
Sample 3: 12 8 15 16 15

8. The following samples could have come from two populations with the same means, assuming the population variance are equal.

|  | Sample I | sample II |
|---|---|---|
| Sample size | 12 | 10 |
| Sample mean | 40.5 | 43.8 |
| Sample variance | 2.6 | 3.2 |

9. From a sample of 800 graduates in a district 245 found to be employed can we conclude that 45% of the graduates in the whole district are employed?

10. The following data relate to the number of units produced per week by three methods

| Method 1 | 170 | 192 | 190 | 120 | |
| Method 2 | 160 | 165 | 170 | 172 | |
| Method 3 | 182 | 190 | 170 | 178 | 185 |

Prepare ANOVA table and write your comments?

11. The temperature of a certain city is studied over 10 days. The temperature (in C) is recorded as follows 25, 27, 29, 24, 30, 35, 27, 24, 26. Perform a t-test to check whether the average temperature across the year is 25 C.

12. Three classes A, B and C studied for proficiency in a subject. The marks secured by a sample of students in each class in given below

A: 77,88,78,87,95,90
B:  55,66,77,65,58,59,62
C:  90,95,94,91,98,85,92

Perform a one-way ANOVA to test the hypothesis that all three classes are equally proficient in the subject.

13. Two independent samples of size 8 and 7 contained following values.

Sample I:  19 17 15 21 16 18 16 14
Sample II: 15 14 15 19 15 18 16

Is the difference between the sample mean significant?

14. Two independent samples of eight and seven items respectively following values of the variable

Sample I: 9 11 13 11 15 9 12 14

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Sample II:10 12 10 14 9 8 10

Do the two estimate of population variance differ significantly at 5% level of significance?

15. Four doctor each test four treatments for a certain disease and observe the number of days each patients takes to recover. The results are as follows. (Recovery time in days)

|  | Treatment | | | |
| Doctor | 1 | 2 | 3 | 4 |
| --- | --- | --- | --- | --- |
| A | 10 | 14 | 19 | 20 |
| B | 11 | 15 | 17 | 21 |
| C | 9 | 12 | 16 | 19 |
| D | 8 | 13 | 17 | 20 |

Discuss the difference between (1) doctors and (2) treatments.

## UNIT-IV NON-PARAMETRIC TESTS

2-Marks

1. Write the formula for chi-square test of single standard deviation?
2. Mention the uses of chi-square test?
3. Define Rank-sum test?
4. Mention the advantages of non-parametric tests?
5. What is the other name or non-parametric>why?
6. When are non-parametric tests used?
7. What is the null hypothesis framed in Mann Whitney test?
8. Write down the working rule for Mann Whitney u-test?
9. Explain sign test?
10. Define one sample run test?
11. When is Kruskal-Wallis test used?
12. Write down one working rule Kruskal-Wallis test?
13. Define rank correlation co-efficient?
14. What adjustment is to be done for tie values to find rank correlation?
15. Mention the properties of linear coefficient of correlation?
16. Why are non-parametric tests less powerful than parametric tests?
17. What is the non-parametric equivalent for the one-way ANOVA test?
18. Write formula of Kruskal-Wallis test
19. What are the uses of chi-square distribution?
20. Define Rank Correlation test?

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13-Marks

1. Write the application of non-parametric test and sign test in statistics?
2. Explain rank sum test and its applications?
3. 1)Distinguish non-parametric methods over parametric methods?
   2)explain the Kruskal Wallis test procedure with appropriate example?
4. The scores of a written examination of 24 students who were trained by using three different methods are given below

| Video cassatas | A | 74 | 88 | 82 | 93 | 55 | 70 | 65 | 92 |
|---|---|---|---|---|---|---|---|---|---|
| Audio cassatas | B | 78 | 80 | 65 | 57 | 89 | 85 | 78 | 70 |
| Class room | C | 68 | 83 | 50 | 91 | 84 | 77 | 94 | 81 |

Use Kruskal Wallis test at a=5%level significance, whether the three methods of training yield the same results?

5. In a study of sedimentary rocks, the following data were obtained from samples of 32 grains from two kinds of sand?

| Sand I | 63 | 17 | 35 | 49 | 18 | 43 | 12 | 20 | 47 |
|---|---|---|---|---|---|---|---|---|---|
| Sand I | 136 | 51 | 45 | 84 | 32 | 40 | 44 | 25 | |
| Sand II | 113 | 54 | 96 | 26 | 39 | 88 | 92 | 53 | 101 |
| Sand II | 48 | 89 | 107 | 111 | 38 | 62 | | | |

6. Ten competitors in a beauty contest are ranked by 3 judges in the following order.

   A: 1 6 5 3 10 2 4 9 7 8
   B: 3 5 8 4 7 10 2 1 6 9
   C: 6 4 9 8 1 2 3 10 5 7

   Find out which pair of judges has awarded the ranks to the nearest common taste of beauty?

7. 1) A plant supervisor ranked a sample of eight workers on one number of hours of overtime worked and length of employment. Is the rank correlation between the two measures signification at the 0.01 level?

| Amount of overtime | 5 | 8 | 2 | 4 | 3 | 7 | 1 | 6 |
|---|---|---|---|---|---|---|---|---|
| Year employed | 1 | 6 | 4.5 | 2 | 7 | 8 | 4.5 | 3 |

   2) explain Mann-Whitney u test with an example?

8. Two scientists are studied over 7 years for number of inventions each year. Use the sign test to find out who is a more productive scientist.

    Scientist A: 5,10 15,11,13,17,12

    Scientist B:10,11,11,12,9,10,11

9. A research was carried out on 155 respondents to test the association between diet and managerial effectiveness. The cross tabulation of the results is given below. Use a chi square test to draw an inference about the relationship between diet and effectiveness. What is the strength of the relationship?

|                | Low effectiveness | High effectiveness |
|----------------|-------------------|--------------------|
| Balanced diet  | 15                | 60                 |
| Imbalanced diet| 70                | 10                 |

10. Test the association of age and preference of colour of toy from the following data

| Age /colour | Below 5 | 6-10 | Above 10 years |
|-------------|---------|------|----------------|
| Pink        | 60      | 40   | 5              |
| Purple      | 30      | 30   | 30             |
| Red         | 80      | 10   | 10             |

## UNIT-V CORRELATION AND REGRESSION

<u>2-Marks</u>

1. Define cyclical variation in a time?
2. What is irregular variation?
3. Mention the four basic c components of a time series?
4. Mention any two models of time series?
5. When is linear regression used?
6. Distinguish between correlation and regression?
7. What is regression analysis?
8. Define secular trend in a time series?
9. What are the causes for a trend in a time series?
10. Briefly explain how a scatter diagram benefits the research?
11. Define correlation coefficient between two variables?
12. What is a scatter diagram?
13. Mention the causes for random variation in a time series?
14. Distinguish between regression and time series analysis
15. How do irregular variations affect time series?
16. Define rank correlation-coefficient and write down the formula.
17. Write down the regression co-efficients
18. Specify the range of correlation
19. Write the equation of regression lines?
20. What is positive and negative correlation?

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<u>13-Marks</u>

1. The following data pertains of x=revenue (in'000 of rupees) generated at a corporate hospital and y=number of patients (in'000) arrived for the last ten years

| x | 86 | 95 | 75 | 85 | 90 | 98 | 112 | 74 | 100 | 110 |
|---|----|----|----|----|----|----|-----|----|-----|-----|
| y | 21 | 24 | 18 | 24 | 22 | 30 | 27 | 18 | 25 | 28 |

   Find the Karl persons coefficient of correlation and give your comment?

2. 1)what are the assumptions made by regression in model in estimating the parameters and in significance testing?

   2) In what ways can regression analysis be used?

3. Data on rainfall and crop production for the past seven years are as follows.

| Rainfall in inches | 20 | 22 | 24 | 26 | 28 | 30 | 32 |
|--------------------|----|----|----|----|----|----|----|
| Crop production | 30 | 35 | 40 | 50 | 60 | 60 | 55 |

   Find the correlation coefficient and comment on the relationship?

4. Describe the components of time series and its uses?

5. Explain various method of trend analysis for financial time series data?

6. Given that overheads expenses and units produced at different plants of a company

| overhead | 191 | 170 | 272 | 155 | 280 | 173 | 234 | 116 | 153 | 178 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| units | 40 | 42 | 53 | 35 | 42 | 39 | 48 | 30 | 37 | 40 |

   Develop the regression equation and predict the overhead with 50 units are produced.

7. Given below are the figures of production (in thousand quintals) of a sugar factory.

| Year | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|------|------|------|------|------|------|------|------|
| Production | 75 | 80 | 95 | 85 | 95 | 10 | 105 |

8. Given that

   $\Sigma X=130$, $\Sigma X^2=2288$, $\Sigma Y=220$, $\Sigma Y^2=5506$ and $\Sigma XY=3467$.

   Compute correlation coefficient and regression equation of X only?

9. Using least square principle, determine the profit trend line for a company that has recorded its profit in lacs of rupees over the last ten years?

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|---|---|---|---|---|---|---|---|---|----|
| Profit | 6 | 6 | 7 | 9 | 10 | 11 | 13 | 15 | 17 | 19 |

10. The percentage of students getting dream placements in campus selection in a leading technical institution during the past five years are as follows.

| Year | 2008 | 2009 | 2010 | 2011 | 2012 |
|------|------|------|------|------|------|
| Percentage | 7.3 | 8.7 | 10.2 | 7.6. | 7.4 |

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Find the linear equation that describe the data. Also calculate the percentage of trend?

11. A study was carried out to identify the impact of training on managerial effectiveness (1 to 5). The data is given below. Perform a regression on the data to predict the effectiveness as a function of the training levels. Derive the regression equation. Predict the effectiveness. If the training level is 3.5.

| Training level | 2 | 2 | 3 | 4 | 5 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| Managerial effectiveness | 1 | 1 | 4 | 4 | 4 | 5 | 2 |

12. Obtain the two regression lines:

| X | 45 | 48 | 50 | 55 | 65 | 70 | 75 | 72 | 80 | 85 |
|---|---|---|---|---|---|---|---|---|---|---|
| Y | 25 | 30 | 35 | 30 | 40 | 50 | 45 | 55 | 60 | 65 |

13. The equation of two variables X and Y as follows 3X+2Y-26=0, 6X+Y-31=0. Find the means, regression coefficient & coefficient of correlation

14. From the following data, find the equation of the regression lines.

|  | Mark in Maths | Mark in English |
|---|---|---|
| Mean | 62.5 | 39 |
| S. D | 9.9 | 10 |

Coefficient of correlation between marks in maths & English =0.60
1) estimate the mark in English when marks in maths is 70
2) estimate the mark in maths corresponding to 54 marks in English

15. A gas company has supplied 18,20,21,25and 25 billion cubic feet f gas, respectively, for the years 2004 to 2008.Find the estimating equation that best describe these data. Calculate the percentage of trend.