Sl. No. :

135(E)

(March, 2015)

Time : 3 Hours]   *[Maximum Marks : 100*

Instructions :

1) This question paper contains 47 questions.
2) All the questions are compulsory. Options are internal.
3) The instructions should be strictly followed.
4) Use of Logarithm table, Z-table and calculator is allowed.
5) Write answers to new section on a new page.

SECTION - A

■ Following 1 to 10 objective questions carry 1 mark each. Select the correct answer from the given options :   [10]

1) In which method the base year is changed every year?
   (A) Total Expenditure Method   (B) Family Budget Method
   (C) Fixed Base Method   (D) Chain Base Method

2) Who prepared the table of random numbers first?
   (A) Rand Corporation   (B) Fisher
   (C) Tippet   (D) Yate

3) If correlation coefficient between X and Y is $r_{xy} = 0.4$, then find the correlation coefficient between $\dfrac{X}{2}$ and $\dfrac{Y}{2}$?
   (A) -0.2 (B) 0.4
   (C) -0.4 (D) 0.2

4) Who developed the method of least square for the fitting of a line of regression?
   (A) Gauss C.F.   (B) Sir Francis Galton
   (C) Charles Spearman   (D) Karl Pearson

5) If $U = \{-1, 0, 1, 2, 3, 4\}$, $A = \{1, 2, 3, 4\}$ and $B = \{-1, 0, 1\}$, then what is $A \cap B'$?

(A) $\{1, 2, 3, 4\}$ (B) $\{1, 2, 3\}$

(C) $\{-1, 0, 1\}$ (D) $\{2, 3, 4\}$

6) How is the value of mean in binomial probability distribution in comparison to its variance?

(A) Less   (B) Equal

(C) More   (D) Minimum

7) What is the value of variance and standard deviation in a normal distribution?

(A) 0·5   (B) 1

(C) 0·675   (D) 0

8) What is the duration of oscillation time series for cyclic fluctuation?

(A) 10 to 20 years   (B) 10 to 15 years

(C) 5 to 10 years   (D) 0 to 5 years

9) Mention the equation of T_{n+1} in geometric progression.

(A) $S_n + S_{n-1}$ (B) $S_n - S_{n+1}$

(C) $S_n - S_n^2$ (D) $S_{n+1} - S_n$

10) Which method of interpolation is used when the distance between the consecutive values of the independent variable X is unequal?

(A) Lagrange's Method   (B) Pascal's Method

(C) Newton's Method   (D) Method of Binomial Expansion

SECTION - B

■ **Following questions from 11 to 20 carry equal marks. Each question carries 1 mark. Give answers in one sentence :**   [10]

11) What is an Index Number?

12) When the use of stratified random sampling method is advantageous?

13) Define the term correlation.

14) Write the linear regression model.

15) Write down the sample space of the following random experiments :
Three balanced coins are tossed together.

16) Write recurrence formula for binomial probability distribution.

17) The mean and standard deviation of the normal variable X are 5 and 2 respectively. Write the prabability density function of X.

18) What is meant by random fluctuation in the study of time series?

19) If $r = -1$, $n = 5$ and $S_n = 1$ then find a.

20) Define the term : Extrapolation.

SECTION - C

■ **Following questions from 21 to 32 carry equal marks. Each question carries 2 marks :** [24]

21) From the statistics of sale of some type of machines from the year 2008 to 2011, the chain base index numbers are obtained as below. Convert these index numbers into fixed base index numbers.

Year	2008	2009	2010	2011
Index Number of sale of Machines	110	112	108	109

22) Find the total number of possible random samples of size 3 each with and without replacement from a population of 25 units.

23) $\sum\limits_{1}^{6} \left(R_x - R_y \right)^2 = 26$ Where R_x and R_y are the ranks given by two judges x and y respectively. Find Spearman's rank correlation coefficient.

24) Identify dependent variable and independent variable in the following cases :

  (i)   Usable space (in sq. meters) and monthly rent (in ₹)

  (ii) Annual profit (in ₹) and annual sale (in ₹)

25) If $P(A) = 0·6$, $P(B) = 0·7$ and $P(A \cup B) = 0·9$, then find probability of event A–B and B–A.

26) Explain the following terms :

    (i)   Sample space

    (ii)   Independent events

OR

For events A, M and F is $P(M) = P(F) = \dfrac{1}{2}$ and $P\left(\dfrac{A}{M}\right) = \dfrac{1}{10}$, $P\left(\dfrac{A}{F}\right) = 0·5$. Find $P(A \cap M)$ and $P(A \cap F)$.

27) What is the probability that 2 out of 5 randomly selected persons would buy readymade garments given that the probability of tendency of buying readymade garments is 0·4?

28) If $3q - 2p = 0·15$ for a binomial probability distribution with parameter P, determine whether its skewness is positive or negative.

29) State the properties of Bernouli Trials.

OR

In a class of 60 students of std. XII, the probability that the height of a student is less than 150 cm. is $\dfrac{1}{3}$. A random sample of 5 students is taken from this class. Find the probability that 4 students have the height that is less than 150 cm.

30) State any four properties of normal distribution.

31) Fit a trend of the line of slope to the following data :

$n = 6$, $\bar{y} = 125$, $\bar{t} = 3·5$, $\Sigma w^2 = 70$, $\Sigma wy = 150$

Transformed Variable $w = 2(t - \bar{t})$.

OR

Explain the importance of the study of time series.

32) The sum of the first 3 terms in a geometric progress is 0·496 and (r) = 0·2 respectively. Find out the first term.

■ **Following 33 to 40 questions carry equal marks. Each question carries 3 marks :** [24]

33) For an item if $\Sigma p_1 q_0 : \Sigma p_0 q_0 = 5:4$ and $\Sigma p_1 q_1 : \Sigma p_0 q_1 = 8:5$, then find I_L, I_p and I_F.

34) A random sample of 100 pages was taken from a book of 1000 pages and the number of printing errors from each of the selected pages of the sample was recorded. The data of records of printing errors are given below :

No. of Printing Errors	0	1	2	3	4	5
No. of Pages	51	23	16	6	3	1

From the sample data, find an estimate of total number of printing errors in the book and its estimated standard deviation.

35) A population of 100 units is divided into two strata of equal sizes. The following information is obtained on the basis of sample observations drawn from each stratum, the sample size being 10% of the size of the stratum.

$$N = 100, \ N_1 = N_2 = 50, \ \overline{y}_1 = 22, \ \Sigma(y_{1i} - \overline{y}_1)^2 = 588,$$
$$n_1 = n_2 = 5, \ \overline{y}_2 = 28, \ \Sigma(y_{2i} - \overline{y}_2)^2 = 980$$

Find the estimate of the population mean and standard deviation of the stratified sample mean.

36) The following information is available regarding marks (X) secured in a test in statistics and marks (Y) secured in a test in accountancy by 6 students. Compute the correlation coefficient between X and Y.

$$n = 6, \ \Sigma x = 61, \ \Sigma y = 58, \ \Sigma xy = 598, \ \Sigma x^2 = 711 \text{ and } \Sigma y^2 = 574.$$

37) Sample data based on a random sample drawn on two variables X and Y of a bivariate population yielded the following information :

$$n = 7 \ \Sigma x = 420, \ \Sigma y = 434, \ \Sigma(x - \overline{x})^2 = 2870, \ \Sigma(y - \overline{y})^2 = 2230$$
and $\Sigma(x - \overline{x})(y - \overline{y}) = 2409$, then

(i) Obtain the regression line of X on Y.

(ii) Find the estimated value of X when Y = 60.

OR

Give the definition and usages of Linear regression.

38) In a class of 15 students 10 are boys and 5 are girls. 2 students are selected at random from the class. Find the probability that there is atleast one girl in the selection of two students.

39) From integers 1 to 100 an integer is selected at random. Find the prabability that the selected integer is divisible by 3 or 7.

OR

A and B are any two events. If $4P(A) = 6P(B) = 10P(A \cap B) = 1$, then obtain

(i) $P(A' \cap B')$

(ii) $P(A/B)$

40) State the limitations of interpolation and extrapolation.

SECTION - E

■ **Give answers of the following questions from 41 to 43. Each question carries 4 marks :**   [12]

41) The distribution of the monthly wages of 1000 employees is normal with the mean equal to ₹ 5,000 and the variance equal to 62,500. Find the range of 80% of the wages of the employees located in the middle of the distribution.

OR

The marks obtained by 10,000 students who appeared in a talent search test of 70 marks are normally distributed with mean and the standard deviation as 30 and 10 marks respectively. Then

(i)   Find the estimated numbers of students who get less than 25 marks, and

(ii) If students who get more than 45 marks are to be awarded scholarships for higher studies, find the numbers of students who will get scholarships.

42) Fit the trend line to the time-series data given in the following table and find the trend values of the series :

Time (t) in years	1	2	3	4	5
Death Rate yt	7·6	7·9	7·9	7·5	8·1

43) A construction company engaged in the housing business proposes a housing scheme of flats of four rooms each in order to attract customers. A customer joining the scheme has to pay the total cost of the flat in 20 annual instlaments. The condition of the scheme is such that the customer has to pay rupee 1 in the first instalment and has to pay in the subsequent instalment the amount twice that of the proceding instalment.

From this information find :

(i) What amount in rupees will the customer has to pay at the 20th instalment?

(ii) What is the total amount in rupees that the customer has to pay at the end of 20 instalments?

(iii) Express the amount of the 20th instalment in terms of percentage of the total cost of the flat?

OR

If $S_n = 2(3^n - 1)$, find T_1 and T_2.

SECTION - F

■ **Solve the following questions as per instructions from 44 to 47. Each question carries 5 marks :** [20]

44) In order to construct the cost of living index number for workers for the year 2005 the data of prices and quantities on items for the group of clothing are given in the following table.

Item	A	B	C	D
Quantity 2003	6	20	4	15
Price (In ₹) 2003	10·00	1·80	11·0	1·20
Price (In ₹) 2005	24·00	4·20	21·00	2·80

It is given that the index number for food is 150, the prices of fuel have increased by 220%, the expenditure on rent for 2005 has increased to ₹ 220 from ₹ 100 in 2003 and the index number for misellaneous items for the year 2005 has increased by 1·75 times that of the base year index number. If the expenditure is incurred on these groups 40%, 12%, 20% and 10% respectively, construct the cost of living index number for the workers.

45) From the following data compute the correlation coefficient between the two variable X and Y.

X :	100	90	80	60	40	40	50
Y :	23	22	19	18	17	16	17

46) The summary measures obtained from the height (X) in cm. and weight (Y) (in Kg.) of 1000 candidates appeared for recruitment in the army are given below :

$$\bar{x} = 169 \text{ cm}, \quad \bar{y} = 67 \text{ Kg}, \quad S_x = 20 \text{ cm}, \quad S_y = 3 \text{ Kg}, \quad r = 0.5$$

then

(i)   Obtain the regression line of Y on X.

(ii) Obtain the regression line of X on Y.

47) On the basis of the data given in the following table find the value of Y when X = 3 by using the Lagrange's method.

X :	1	2	4
Y :	6	10	36

OR

The weight (in Kg) corresponding to the age (in months) of a baby is given in the following table. Find the estimated weight (in Kg) of the baby when it is 2·5 months old, by using Newton's Interpolation formula.

Age of baby (in months)	X	1	2	3	4
Weight of baby (in Kg.)	Y	3·5	5·0	5·8	6·5

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