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1B6M18304

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Sixth Semester B.Sc Statistics Degree Examination, March 2018
ST6B10 – Time Series and Index Numbers
 (2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

PART A

(Answer ALL the questions. Each carries 1 mark.)

Fill in the blanks (Questions 1-6)

1. The method which determines secular – trend with the help of two points only is known asmethod.
2. For the values 15, 24, 18, 33, 42 the three years moving averages are,,
3. Year- to-year indices in the chain - base method are called
4. If an old series is connected with a new series of index numbers, it is known as
5. An additive model of time series is.....
6. In the method of semi- averages, trend is assumed to be.....

Multiple Choice Questions (Questions 7-12)

7. The weights used in Paashe’s index number belongs to
 - a) base year (b) the given year (c) to any arbitrary chosen year (d) none of these
8. If the units of measurement of a commodity changes, the value of index number
 - a) also changes b) remains same
 - c) increases d) decreases
9. The component of a time series which is attached to short – term fluctuations is:
 - a) seasonal variation b) cyclic variation c) irregular variation d) All the above
10. A group for moving average consists of :
 - (a) 5 – years period (b) 3 – years period
 - (c) a period which forms a cycle (d) none of the above
11. The geometric mean of Laspeyre’s and Paasche’s index numbers is
 - a) Kelley’s index number b) Dorbish – Bowley’s index number
 - c) Fisher’s index number d) none of these
12. The moving averages in a time series are free from the influences of:
 - (a) seasonal and cyclic variations (b) seasonal and irregular variations
 - (c) trend and cyclical variations (d) trend and random variations

(12 x 1 =12 Marks)

PART B

(Answer any SEVEN questions. Each carries 2 marks.)

13. What is meant by unit test?
14. Index numbers are economic barometers. Explain.
15. What is meant by cyclic variation in time series?
16. What is principle of least squares.
17. If the group indices are 80, 120 and 125 and their respective group weights are 60, 20 and 20, find the consumer price index.
18. What is Gini's coefficient?
19. Define Pareto distribution.
20. Give an example for a likert type question.
21. Give formula for converting chain base into fixed base and fixed base into chain base index. (7 x 2 = 14 Marks)

PART C

(Answer any SIX questions. Each carries 5 marks.)

22. Explain factor reversal test.
23. What is consumer price index?
24. Name various components of a time series.
25. Explain semantic differential scale of attitude measurement.
26. How do you fit a trend line by the method of least squares?
27. Explain Lorentz curve.
28. What are the major statistical limitations to nominal scaled data.
29. Write a short note on Gompertz curve with its relevance in time series analysis. (6 x 5 = 30 Marks)

PART D

(Answer any THREE questions. Each carries 8 marks)

30. What is meant by deflating the index numbers and how can it be done.
31. Explain time reversal test and factor reversal test. Show that Fisher's ideal index number satisfies both these tests.
32. Describe the method of moving averages for estimating the trend in a time series. Discuss its merits and demerits.
33. What are the components of time series. Explain with example.
34. Obtain the trend values using 4 yearly moving average.

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Production	464	515	518	467	502	540	557	571	586	612
In'000s										

(3 x 8=24 Marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Statistics Degree Examination, March 2018

ST6B11 – Design of Experiment

(2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

Part A**(Answer all questions; each question carries 1 mark)**

1. Give the least square estimate of β of the linear model $Y = A\beta + e$
2. Estimate sum of square of the linear model is
3. The unbiased minimum variance linear estimate of an estimable parametric function is called
4. The experimental error is controlled through the principle of
5. A completely randomized design is also known as
6. Lati square design controls variation.

State true or false

7. Equality of several normal population means can be tested by t-test.
8. Randomization is used to control known variations.
9. The missing observation in an RBD is obtained by minimizing variance.
10. The error degrees of freedom for two-way ANOVA with r rows and c columns is $rc-1$.
11. For a 2^3 factorial with 4 replications the error degrees of freedom is 21.
12. Factorial experiments are experiments with more than two factors at more than two levels.

(12 x 1 = 12 Marks)**Part B****(Answer any seven questions; each question carries 2 marks)**

13. What is a linear hypothesis?
14. Give the least square estimate of σ^2 in the linear model.
15. Distinguish between the analysis of variance with single and multiple observations per cell.
16. State any two disadvantages of CRD?
17. What is the purpose of blocking in the design of an experiment?
18. LSD eliminates two sources of variations, Explain.
19. Give the expression for estimating one missing value in RBD
20. Describe the concept of confounding in factorial experiments?
21. Discuss the sum of squares of effects and interactions of a 2^2 factorial experiment.

(7x2=14 Marks)

Part C

(Answer any six questions; each question carries 5 marks)

22. Define linear model. Obtain least square estimates of the parameters of the linear model.
23. Let y_1, y_2, y_3, y_4 are four independent random variables with common variance σ^2 . $E(y_1) = E(y_3) = \theta_1 + \theta_2$ and $E(y_2) = E(y_4) = \theta_1 + \theta_3$. Show that $\theta_2 - \theta_3$ and $2\theta_1 + \theta_2 + \theta_3$ are estimable. Obtain the BLUE's for them.
24. Compare the efficiency of RBD with CRD. Obtain relative efficiency of RBD in comparison to CRD.
25. What are the advantages of LSD over RBD?
26. Describe the analysis of LSD. Give an example.
27. Describe the analysis of covariance.
28. What is meant by main effects and interaction effects in factorial experiment?
29. Explain Yates procedure used in factorial experiments.

(6x5=30 Marks)

Part D

(Answer any three questions; each question carries 8 marks)

30. Prove a necessary and sufficient condition of estimability. If $e'\beta$ and $m'\beta$ are estimable, find $V(e'\hat{\beta})$ and covariance $(e'\hat{\beta}, m'\hat{\beta})$, where $\hat{\beta}$ is the least square estimate of β .
31. (a) Describe one way classification for ANOVA.
(b) The following data is the produce in kg of three varieties A, B and C of wheat sown in 12 plots.

A	14	16	18		
B	14	13	15	22	
C	18	16	16	19	20

Is there any significant difference in the production of three varieties?

32. Define concomitant variable. Explain ANCOVA for one way classified data with one concomitant variable.
33. Describe the basic principles of experimentation. How are these implemented in an LSD.
34. Explain the need for confounding in factorial experiments. In a 2^3 factorial experiment with A, B, C as factors, suppose that ABC is to be confounded. How would you arrange the various treatment combinations?

(3 x 8=24 Marks)

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(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Sixth Semester B.Sc Statistics Degree Examination, March 2018
ST6B12 – Population Studies and Actuarial Science
 (2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

PART-A**Answer all questions. Each question carries one mark**

1. The simplest measure of mortality is
 a) Standardized death rate b) IMR c) CBR d) CDR
2. is usually known as the radix of the life table
 a) l_0 b) T_0 c) e_0 d) x
3. Which of the following measures is most suitable for comparing fertility levels of two or more different populations?
 a) CBR b) GFR c) Standardized Birth Rate d) ASFR
4. CBR of any population is generally GFR of the same population.
 a) Equal to b) greater than c) Less than d) None of these.
5. Uncertainty of loss is known as.....
 a) Peril b) hazard c) risk d) loss exposure
6. What is the symbol used to denote expectation of life at birth?
7. The main peril covered in a fire insurance contract is ...
8. The full form of GRR is
9. For a stationary population, the value of NRR is
10. The average number of births occurring in a given population per thousand persons in a year is termed as
11. is the year in which the last population census was conducted in India.
12. Life tables are usually constructed for males and females separately (True/False).

(12 x 1= 12Marks)**PART-B****Answer any seven questions. Each question carries two marks.**

13. Define vital events?
14. Define hazard.
15. What is Pearl's vital index?
16. Define insurance.
17. Define general fertility rate.
18. Define total fertility rate.
19. Name any four life insurance schemes.
20. Define force of mortality.
21. Define L_x .

(7 x 2= 14 Marks)

PART-C

Answer any six questions. Each question carries five marks.

22. Explain about health insurance.
23. Describe the indirect method of standardizing death rates.
24. Define Crude death rate. List out its advantages and disadvantages.
25. Explain various uses of life tables.
26. What do mean by abridged life table. Explain Reed Merrel's method.
27. Fill in the blanks in a portion of life table given below.

Age	l_x	d_x	p_x	q_x	L_x	T_x	e_x^0
4	95000	-	-	0.0052632	-	-	52
5	-	400	-	-	-	-	-

28. Calculate TFR from the following data.

Age group	15-20	20-25	25-30	30-35	35-40	40-45	45-50
ASFR	22	125	150	110	30	10	0

29. Explain about Infant Mortality Rate.

(6 x 5= 30Marks)

PART-D

Answer any three questions. Each question carries eight marks.

30. Explain various sources of vital statistics.
31. Explain the benefits and cost of insurance to society.
32. Compute (i) GFR (ii) ASFRs (iii) TFR and (iv) GRR, from the data given below:

Age group	15-19	20-24	25-29	30-34	35-39	40-44	45-49
No. of women	16000	16400	15800	15200	14800	15000	14500
Total births	260	2244	1894	1320	916	280	145

Assume that the proportion of female births is 46.2 per cent.

33. Explain the various columns of a life table and the expressions for calculating the values of each column.
34. Briefly explain various non-life insurance contracts.

(3 x 8= 24Marks)

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Sixth Semester B.Sc Statistics Degree Examination, March 2018
ST6B13 – Linear Regression Analysis
(2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

Part A

Answer all questions. Each carries 1 mark

1. The unbiased estimate of the variance of the residual term is
2. The least square estimate of β_{yx} is
3. In the regression model $Y = \beta_0 + \beta_1 X + \epsilon_i$, The variance of β_1 is
4. Both the regression coefficients cannot exceed
5. The square of the correlation coefficient is called
6. Correlation coefficient is an appropriate measure of the relationship between two variables, only when the functional relationship between them is
a. Linear b. Nonlinear c. Parabolic d. None of the above.
7. In the regression line $Y = \beta_0 + \beta_1 X + \epsilon_i$, β_0 is the of the regression line.
8. What is the point at which the two lines of regressions intersect?
9. Regression coefficient is independent of the change of
a. Origin b. scale c. both origin and scale d. neither origin nor scale.
10. Write down the mathematical model for the multiple linear regression with k independent variables.
11. The general form of a logistic regression model is
12. The square root of estimate of variance of error in linear regression model is termed as.....

(12 x 1=12marks)

Part B

Answer any 7 questions. Each carries 2 marks.

13. What are the assumptions about the error term in the regression model?
14. What do you understand by fitting of regression equation?
15. How do you estimate parameters of the regression equation?
16. How do you interpret the value of the regression coefficient?
17. Write down the expression for the estimators of the parameters in the model

$$Y_i = \beta_0 + \beta_1 X_i + \epsilon_i.$$

18. Write the uses of ANOVA in regression.
19. Give the expression for the 95% confidence of the regression coefficient of y on x .
20. What is meant by curve linear regression?
21. If the regression line of Y on X is $Y = 2X + 1$ and that of X on Y is $6X = Y - 3$, what is the correlation between Y and X ?

(7 x 2=14marks)

Part C

Answer any six questions. Each carries 5 marks.

22. What is regression? Explain the significance of the concept with the help of an example.
23. Distinguish between regression and correlation analysis with the help of an example.
24. Explain the method of testing the significance of the regression coefficient in simple linear regression model.
25. Explain the concept of logistic regression.
26. Derive the expression for the 95% confidence interval for the regression coefficient in simple linear regression model.
27. Explain logistic regression models for binary output data.
28. Show that least square estimator of β is an unbiased estimator of β for a multiple regression model.
29. Obtain the least square estimates of regression parameters in simple linear regression model.

(6 x 5 = 30marks)

Part D

Answer any three questions. Each questions carries 8 marks.

30. Obtain the least square estimator of β_1 in simple linear regression model $Y_i = \beta_1 X_i + \epsilon_i$.
31. The following data give the annual incomes (in thousands of dollars) and amounts (in thousands of dollars) of life insurance policies for eight persons.

Annual income	42	58	27	36	70	24	53	37
Life insurance	150	175	25	75	250	50	250	100

Fit regression line of amounts of life insurance policies on annual income for this data.

32. The following are midterm and final examination test scores for 10 students from a calculus class, where x denotes the midterm score and y denotes the final score for each student.

x	68	87	75	91	82	77	86	82	75	79
y	74	79	80	93	88	79	97	95	89	92

Plot the points and comment on the relationship between x and y .

33. The following data relate to the prices (Y) of five randomly chosen houses in a certain neighborhood, the corresponding ages of the houses (x_1), and square footage (x_2).

Y	x_1	x_2
100	1	1
80	5	1
104	5	2
94	10	2
130	20	3

Fit a multiple linear regression model of Y on x_1 and x_2 .

34. It is believed that exposure to solar radiation increases the pathogenesis of melanoma.

Suppose that the following data give sunspot relative number and age-adjusted total incidence (incidence is the number of cases per 100,000 population) for 8 different years in a certain region.

Sunspot relative number	104	12	40	75	110	180	175	30
Incidence total	4.7	1.9	3.8	2.9	0.9	2.7	3.9	1.6

Test for the significance of regression coefficient of incidence total on sunspot relative number.

(3x8=24marks)

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Statistics Degree Examination, March 2018

ST6B14(P) – Practical II

(2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

Use of calculator and statistical table is permitted.**Answer any four questions.****Each question carries 20 marks.**

1. Use simplex method to solve the following LPP.

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{Subject to : } x_1 + x_2 \leq 10$$

$$3x_1 + 4x_2 \leq 38$$

$$x_1 \geq 0, x_2 \geq 0$$

- a) Yields of 5 varieties in a 4 replicate experiment are given below. Estimate the missing value.

Blocks	Treatments				
	I	II	III	IV	V
1	19.5	16.7	18.0	16.3	17.1
2	12.5	—	13.2	14.8	16.1
3	16.4	18.1	17.0	19.1	20.2
4	17.0	18.9	13.2	18.3	19.0

- b) The number of defects in 23 pieces of cloth each of 100 meters length is given below. Draw an appropriate control chart and comment on it.

1, 3, 2, 3, 1, 5, 6, 4, 3, 7, 11, 9, 6, 4, 9, 4, 3, 1, 2, 5, 7, 6, 4

2. a) Calculate the trend values by finding three yearly moving averages for the following data. Plot the original and trend values on a graph.

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sales	1232	1058	1198	1289	1452	1125	1420	1308	1280	1150

b) Eight samples each of size 5 are drawn at regular intervals from a manufacturing process. The means and the ranges of samples are given below. Construct a suitable control chart and comment on the state of control of the process.

Sample No.	1	2	3	4	5	6	7	8
Mean	12.5	11.8	11	11.5	10.9	9.8	10.5	9.6
Range	7	5	8	6	7	9	4	5

$$(A_2 = 0.577, D_3 = 0, D_4 = 2.115)$$

3. a) Complete the following table for the analysis of variance and expected mean squares of a fixed effect Latin square design.

Sources of variation	Sum of squares	Degrees of freedom	Mean square	Expected mean square
Columns	—	6	—	—
Rows	4.50	—	—	—
Treatments	—	—	2.5	—
Error	—	—	0.6	—
total	40.10	—	—	—

5. a) Fit a straight line trend for the following data using the method of least squares and estimate the value for the year 2018.

Year	2010	2011	2012	2013	2014	2015	2016	2017
Sales	68	81	128	139	136	124	169	187

b) There are four persons and four jobs are to be assigned and the associated cost matrix is as follows. Find the proper assignment to minimize the total cost.

JOBS	MAN			
	A	B	C	D
I	11	13	20	12
II	6	11	8	9
III	13	15	14	12
IV	9	16	12	10

6. a) A company has 3 factories at A, B, C, and 3 warehouses at W_1, W_2, W_3 . The factories are capable to produce 280, 190 and 120 units respectively in a week. Weekly warehouses requirements are 220, 150, 135 units respectively. The transportation costs (in rupees) from the factories to the warehouses are as follows:

Factory	W_1	W_2	W_3
A	18	23	13
B	15	9	21
C	29	25	15

Determine the optimum distribution for this company to minimize transportation costs.

- b) Calculate seasonal indices by the ratio - to - moving average method (assuming multiplicative model) for the given data

Year \ Quarter	Q_1	Q_2	Q_3	Q_4
2014	80	74	61	69
2015	86	64	62	81
2016	91	73	67	84
2017	98	76	69	90

(4 x 20 = 80 Marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Sixth Semester B.Sc Statistics Degree Examination, March 2018
ST6E03 – Reliability Theory
 (2015 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

Part A

(Answer all questions; each question carries 1 mark)

Multiple Choice Questions (Questions 1-6)

1. The dual of k-out of-n structure is
 - (a) k-out of-n structure
 - (b) (n-k) – out of –n structure
 - (c) (n-k-1) – out of –n structure
 - (d) Parallel structure of n components
2. The structure function of *parallel system* is
 - (a) $\phi(x) = \max(x_1, x_2, \dots, x_n)$
 - (b) $\phi(x) = \min(x_1, x_2, \dots, x_n)$
 - (c) $\phi(x) = (x_1 + x_2 + \dots + x_n)$
 - (d) $\phi(x) = (x_1 + x_n)$
3. For a coherent system which of the following is true
 - (a) A component may be relevant
 - (b) Each of the component is relevant
 - (c) No component is relevant
 - (d) At least two components are relevant
4. Reliability of two component series system is
 - (a) p^2
 - (b) $1 - p^2$
 - (c) $p(1 - p)$
 - (d) None of the above
5. The structure function of 2-out of -3 structure is
 - (a) $x_1x_2x_3$
 - (b) $x_1x_2x_3 + x_1x_2(1 - x_3) + x_1(1 - x_2)x_3 + (1 - x_1)x_2x_3$
 - (c) $1 - x_1x_2x_3$
 - (d) None of the above
6. If $\mu = 1$, then the failure rate of $\exp(\mu)$ is
 - (a) 0
 - (b) 1
 - (c) e
 - (d) e^{-1}

Fill in the blanks (Questions 7-12)

7. 3-out of -3 system is a _____ system.
8. Reliability of a 2- component series system is _____.
9. The _____ in a system is called order of the system.
10. The dual structure of parallel structure is _____ structure.
11. The distribution having mean and variance equal is _____.
12. $E(\phi(x))$ represents _____ of a system.

(12 x 1 = 12 Marks)

Part B

(Answer any seven questions; each question carries 2 marks)

13. What do you mean by state of a system?
14. What do you mean by dual of a structure ϕ .
15. Define coherent system. With an example.
16. Define minimal cut sets.
17. Explain bridge structure
18. What do you mean by relative importance of components?
19. Discuss the role of exponential distribution in reliability theory.
20. Explain the concepts of DFR and IFR distributions.
21. Define Poisson distribution.

(7 x 2 = 14 Marks)

Part C

(Answer any six questions; each question carries 5 marks)

22. When do you say that a component is irrelevant to the structure ϕ . Give one example.
23. Derive the reliability of k -out of n structure.
24. With usual notation show that for a structure function ϕ order n ,
$$\phi(\mathbf{x}) = x_i \phi(\mathbf{1}_i, \mathbf{x}) + (1 - x_i) \phi(\mathbf{0}_i, \mathbf{x})$$
 for all \mathbf{x} ($i=1, 2, \dots, n$)
25. Explain the minimal path and minimal cut representation of a bridge structure.
26. Define (i) module and (ii) proper module of a coherent system.
27. Define hazard rate. Find hazard rate of exponential distribution.
28. State and prove additive property of Poisson distribution.
29. Derive the relationship between cumulative hazard rate and reliability function.

(6 x 5 = 30 Marks)

Part D

(Answer any three questions; each question carries 8 marks)

30. Let $h(\mathbf{p})$ be the reliability function of a coherent structure. Show that $h(\mathbf{p})$ is strictly increasing in each p_i for $0 \ll \mathbf{p} \ll 1$.
31. Explain Inclusion Exclusion method for finding reliability.
32. Let $\phi(\underline{x})$ be the structure function of a coherent system of order n . Then show that
$$\prod_{i=1}^n x_i \leq \phi(\underline{x}) \leq \prod_{i=1}^n x_i.$$
33. Define Lack of memory property. Show that exponential distribution has this property.
34. Show that the hazard function uniquely determines the reliability function.

(3 x 8 = 24 Marks)