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1B6A22079 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Statistics Degree Examination, April 2022

BST6B16 (E1) – Reliability Theory

(2019 Admission onwards)

Time: 2 hours Max. Marks : 60

Section A
(Each question carries 2 marks)

1. Define series system and parallel system.
2. State the pivotal decomposition of structure function.
3. Define a coherent structure.
4. Define structural importance.
5. Define failure rate function..
6. Define critical path.
7. State mini max bound for system reliability.
8. What is modular decomposition of system?
9. What is the use of distributions in system reliability?
10. Define Poisson process.
11. Define DFR distributions.
12. What is the failure rate of exponential distribution?

Maximum Marks = 20

Section B
(Each question carries 5 marks)

13. Explain the method of finding bounds on system reliability.
14. Discuss the shape of system reliability.
15. Define reliability importance of a component. Give one example.
16. Let $\phi(\underline{x})$ be the structure function of a coherent system of order n. Then show that

$$\prod_{i=1}^{n} x_i \le \phi(\underline{x}) \le \coprod_{i=1}^{n} x_i .$$

17. Obtain the bounds on system reliability, when components are independent
18. How can obtain failure rate function using reliability function.
19. State and prove the lack of memory property of exponential distribution.

Maximum Marks = 30

Section C

(Answer any one question; each question carries 10 marks)

20. Let ϕ be a coherent structure. Discuss the method of finding more important component in the system, while system reliability and component reliabilities are made available.

21. Explain the procedure of finding failure rate patterns, IFR, DFR and bathtub shaped, of various distributions. .

(10 x 1=10 Marks)

1B6A22078 (Pages : 2) Reg. No:.....

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Statistics Degree Examination, April 2022

BST6B12 – Operations Research and Statistical Quality Control

(2019 Admission onwards)

Time: 2 ½ hours Max. Marks : 80

PART A

Each Question Carries 2 Marks

1. Define Solution and Feasible Solution of a LPP.
2. State Standard form of LPP.
3. Distinguish between Unbounded and Degenerate solution of a LPP.
4. State Transportation Problem (TP) mathematically.
5. State merits and demerits of North West Corner Rule.
6. Define Balanced and Unbalanced assignment problem. (AP)
7. Define Non Degenerate BFS of a TP.
8. Define "Quality "of a product.
9. Define Process Control and Product Control.
10. Distinguish between "defect" and "defective".
11. State the necessity of a pair of Control Charts for variables?
12. Define Producer's Risk and Consumer's Risk.
13. Define OC function of a Sampling Inspection Plan.
14. Define AQL and LTPD.
15. Define AOQ and AOQL.

Maximum: 25 marks

PART B

Each Question Carries 5 Marks

16. Sole the following LPP graphically.

    Maximize $Z = 6x + 3y$,

    Subjected to $5x + 3y \leq 15$, $2 \leq x + y \leq 4$

    $x, y \geq 0$.

17. Using an example show that Dual of Dual is Primal.
18. Briefly explain the Least Cost Cell Method of finding an IBFS to a TP.

19. Solve the following AP

Job ↓Person→	A	B	C	D
1	16	14	18	19
2	12	16	15	17
3	12	13	15	16
4	13	11	13	14

20. Explain Chance and Assignable causes of variation.

21. Explain Statistical basis of Control Charts and 3σ limits.

22. Explain Sampling Inspection Plans used in product control.

23. The following are no.of defects observed per unit in a production process.

4, 5, 2, 0, 1, 6, 3, 2, 7, 4, 4, 1. Construct a suitable control chart and verify process control.

Maximum: 35 marks

PART C

Answer any two questions. Each question carries 10 marks

24. Solve the Dual of Minimize $Z = 9x + 10y$

Subjected to $x + 2y \geq 35$, $4x + 3y \geq 24$, $3x + 2y \geq 60$

$x, y \geq 0$

Hence obtain the solution of Primal.

25. Obtain an IBFS to the given TP using Vogel's Approximation Method

From↓ To→	D1	D2	D3	D4	Supply
O1	12	7	4	9	100
O2	13	5	8	10	140
O3	11	9	14	12	160
O4	8	16	11	7	90
Demand	125	155	145	105	

26. Explain Double Sampling Plan. State the merits of DSP over SSP.

27. Plot the OC function of SSP with N = 1000, n = 100, C = 2.

2 x 10 = 20 marks

1B6A22077

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Statistics Degree Examination, April 2022

BST6B11 – Population Studies, Actuarial Science and Vital Statistics

(2019 Admission onwards)

Time: 2 ½ hours

Max. Marks : 80

PART A
Each question carries 2 marks.

1. Write the relation between N. R. R. and G. R. R.
2. What are the drawbacks of CDR?
3. Define force of mortality.
4. What do you mean by proximate cause in insurance?
5. Define risk.
6. What is expectation of life?
7. Define crude birth rate.
8. What is meant by stationary population?
9. Define peril and hazard.
10. Define Total Fertility Rate (TFR).
11. What is the difference between moral and morale hazard?
12. In a population of 183450 individuals in a year there were 5400 births and 4730 deaths. Calculate the crude birth rate.
13. Why are gambling losses uninsurable?
14. Define Age Specific Death Rate.
15. Define net reproduction rates. What interpretation can be made if the NRR is 1, less than 1 or greater than 1?

PART B
Each question carries 5 marks

16. Briefly explain marine insurance.
17. Distinguish between curtate expectation of life and complete expectation of life.
18. Describe reinsurance and double insurance. Also explain the difference between them.
19. Explain the method of calculating the premium of life insurance.
20. What do you mean by an abridged life table? Explain Reed-Merrell method.
21. Explain gross reproduction rate.

22. Explain infant mortality rate. Why is it not a probability rate?

23. Fill in the blanks in the portion of life table given below:

Age	l_x	d_x	p_x	q_x	L_x	T_x	e_x^0
7	90000	500	-	-	-	4850000	-
8	-	400	-	-	-	-	-

Maximum Mark =35

PART C

Each question carries 10 marks (Answer any TWO Questions)

24. What do you understand by the term 'vital statistics'? Explain its various uses.

25. Calculate (i) G.F.R (ii) S.F.R (iii) T.F.R and (iv) G.R.R from the following data.
It is given that out of 9000 births, the number of females is 4300.

Age Group	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50
No. of women('000)	25	24	20	16	15	12	8
No. of live births	1140	3000	2740	1630	600	150	10

26. (a) What do you understand by the term insurance? Describe the benefits and costs of insurance system to society?
(b) Explain different branches of insurance.

27. Describe the various components of a life table. How is the expectation of life at birth determined from a life table? How can it be calculated from census data?

1B6A22076

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Statistics Degree Examination, April 2022

BST6B10 – Design of Experiments

(2019 Admission onwards)

Time: 2 ½ hours

Max. Marks : 80

PART A
Each question carries 2 marks

1. Define Linear estimation
2. Write a linear hypothesis
3. State Gauss- Markov theorem
4. Write the linear model for two way ANOVA
5. What is meant by error sum of squares ?
6. What are the uses of Duncan's multiple range test.
7. What is meant by blocking in randomized block experiment?
8. Write any situation where Graeco-Latin square design is suitable.
9. State all three basic principles of design
10. Draw the layout of 4×4 Latin square design.
11. State relative efficiency of LSD over RBD.
12. Write estimator for single estimator from a RBD.
13. State the linear model for LSD.
14. Write layout of 2^3 factorial design
15. State the parameters of BIBD

Maximum Mark = 25

PART B
Each question carries 5 marks

16. Let $E(Y_1) = 2\beta_1 + \beta_2 - \beta_3$, $E(Y_2) = \beta_1 - \beta_3$ and $E(Y_3) = \beta_1 + 2\beta_2 + 3\beta_3$ are expected values of three linear models. Then check that $3\beta_1 - 2\beta_2 + \beta_3$ estimable parametric function or not.
17. Explain the working steps of one way ANOVA.
18. Find the efficiency of RBD over CRD.
19. Write a short note on $c \times c$ LSD.
20. Find the two missing values in a RBD, then update its ANOVA table

21. Explain the working of Least Significant Difference (LSD) test.

22. Write a short note on principles of design of experiments.

23. Explain the deference between 2^2 factorial experiment and 2^3 factorial experiment.

Maximum Mark = 35

PART C

Each question carries 10 marks (Answer any TWO Questions)

24. State and prove Gauss-Markov theorem.

25. Derive the ANOVA table for two way ANOVA.

26. Find the efficiency of LSD over CRD.

27. Define the main effects and interaction effects in a 2^3 factorial experiment. Also give its ANOVA table.

1B6A22075

(Pages : 2)

Reg. No:.....

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Statistics Degree Examination, April 2022

BST6B09 – Time Series and Index Numbers

(2019 Admission onwards)

Time: 2 ½ hours

Max. Marks : 80

PART A

Each question carries 2 marks.

1. Define seasonal variations in time series with example.
2. Explain additive model in time series
3. State Pareto's law of income distribution
4. Explain time-reversal test
5. Explain lognormal distribution.
6. Define index numbers.
7. What is Gini's coefficient?
8. Explain Dorbish and Bowley's index number.
9. What are the scales of measurements?
10. Define Likert scale.
11. Define quantity index number
12. What is weighted-aggregate index number?
13. Explain any two limitations of 'scales'
14. If the three year moving average is 25 and the first two values are 10 & 29 then the third value is .....
15. What is cost of living index?

Maximum Mark = 25

PART B

Each question carries 5 marks

16. Explain Log-Normal distribution
17. Explain Link relative method and its merits and demerits
18. Write a note on base shifting, splicing and deflating of index numbers.
19. If X & Y are two independent Log-Normal variates then ST the product XY and the ratio (X/Y) are also log-Normal

20. Explain the use of Pareto distribution and its applications.

21. Give major limitations of index numbers.

22. Explain the Ratio to trend method.

23. Explain Lorentz curve

Maximum Mark = 35

PART C

Each question carries 10 marks (Answer any TWO Questions)

24. What are the components of time series ? Explain each with example.

25. Fit a linear trend for the data and estimate the population at 2050

Year	2001	2002	2003	2004	2005	2006	2007
population	80	90	92	83	94	99	92

26. Explain the different classifications and types of index numbers with example

27. Construct Laspeyre's & Pasche's Price Index number, hence find Fisher's Index number

Items	2015		2020	
	Price(Rs)	Quantity(Kg)	Price(Rs)	Quantity(Kg)
A	26	5	30	4
B	40	1	60	1
C	30	20	36	24

(2 × 10 = 20 marks)