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2M3N17115 (Pages : 2) Reg. No:.............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester M.Sc Degree Examination, November 2017

ST3C11 - Stochastic Process

(2016 Admission onwards)

Max. Time: 3 hours Max. Weightage:36

PART A

(Answer ALL Questions) Weightage 1 for each question

1. Define stochastic process.
2. Define stationary process.
3. Show that the one step TPM of a Markov chain is stochastic
4. State and prove the memory less property of exponential distribution
5. Write down the postulates of a Poisson process
6. Define Compound Poisson process
7. Show that the renewal function $m(t) = \sum_{n=1}^{\infty} F_n(t), \forall t$, where $F_n(t) = P(S_n \leq t), n \geq 1, \forall\, t$.
8. Define conditional mixed Poisson process
9. Show that the number of renewals by time $t \geq n$ if and only if the n^{th} renewal occurs on or before time t.
10. Distinguish between open and closed systems
11. Define Brownian motion process
12. Write down the steady state equations of Erlang's Loss system

(12 x 1= 12 weightage)

PART B

(Answer any EIGHT Questions) Weightage 2 for each question

13. Prove that Markov chain is completely determined by the one-step TPM and the initial distribution.

14. Show that state i is recurrent if $\sum_{n=1}^{\infty} p_{ii}^{(n)} = \infty$ and is transient if $\sum_{n=1}^{\infty} p_{ii}^{(n)} < \infty$.

15. Let $\{X_n,\ n = 1, 2, \ldots\}$ be a four step Markov chain with one step TPM $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1/3 & 0 & 2/3 & 0 \end{bmatrix}$.

Check whether the matrix is periodic.

16. Prove that the interval between two successive occurrences of a Poisson process follow exponential distribution

17. For a branching process show that $Q_n(s)=Q_1(Q_{n-1}(s))$.

18. Derive Pollock-Kinchins formule

19. Show that the renewal function satisfies renewal equation

20. Let S_n be the waiting time for the occurrence of n^{th} renewal and $m(t)$ be the renewal function of renewal process. Show that $E\{S_{N(t)+1}\} = E(X_1)\{1 + m(t)\}$.

21. Explain the regenerative stochastic process and semi-Markov process

22. What is Inspection Paradox? Explain it in the context of a renewal process

23. Explain Arbitrage theorem

24. Derive the distribution of first hitting time of a Brownian motion process.

(8 x 2 =16 weightage

PART C

(Answer any TWO Questions) Weightage 4

25. Show that periodicity is a class property.

26. Derive the limiting probabilities of a Birth-Death process.

27. State and prove elementary renewal theorem

28. Explain the transient behavior of M/M/1 model.

(2 x 4 = 8 weightag

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1M3N17116 (Pages : 2) Reg. No:...............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester M.Sc Degree Examination, November 2017

ST3C12 - Testing of Statistical Hypotheses

(2016 Admission onwards)

Max. Time: 3 hours Max. Weightage:36

PART-A

Answer all questions. Weightage 1 for each question.

1. Define power function and OC function.
2. Define one parameter exponential family. Show that it has MLR property.
3. Define UMP unbiased test.
4. If $x \geq 1$ is the critical region for testing $H_0: \theta = 2$ against $H_1: \theta = 1$, on the basis of the single observation taken from population with p.d.f $f(x,\theta) = \theta e^{-\theta x}$, $x > 0$. Obtain the values of power and significance level.
5. Distinguish between size of a test and level of significance.
6. Distinguish between randomized and non-randomized tests.
7. Explain the features of SPRT.
8. Define ASN function. Explain its uses
9. Define likelihood ratio test.
10. Distinguish between parametric and non-parametric test.
11. Define Bayesian test
12. Explain sign test.

(12x1=12 Weightage)

PART – B

Answer any 8 questions. Weightage 2 for each question.

13. Let $X \sim N(\mu,4)$. To test $H_0: \mu = -1$ against $H_1: \mu = 1$ based on a sample of size 10 from this population, we use the critical region $X_1+2X_2+3X_3+...+10X_{10} \geq 0$. What is its size? Find the power of the test.
14. What is likelihood ratio test? Obtain the same for testing the significance of mean in Normal distribution with unknown variance.
15. Define MLR property. Explain how MLR property can be used to find a UMP test
16. Describe Mann- Whitney-Wilcoxon test.
17. Explain Kolmogrov-Smirnov test.
18. Prove that SPRT terminates with probability 1.
19. Derive the approximate expression for ASN function in SPRT.
20. Given a random sample $x_1,x_2,...,x_n$ from the distribution with p.d.f $f(x,\theta) = \theta e^{-\theta x}$, $x > 0$. Show that there exists no UMP test for testing $H_0: \theta = \theta_0$ against $H_1: \theta \neq \theta_0$.
21. Examine whether a best critical region exists for testing the null hypothesis $H_0: \theta = \theta_0$ against the alternative hypothesis $H_1: \theta > \theta_0$ for the parameter θ of the distribution $f(x,\theta) = \frac{1+\theta}{(x+\theta)^2}$, $1 \leq x < \infty$.
22. State and prove Karlin Rubin theorem.
23. If X follows $N(\mu,1)$ obtain UMPU test for $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$
24. Explain Levene's test.

(8x2=16 Weightag

PART – C

Answer any 2 questions. Weightage 4 for each question.

25. Define most powerful test. State and prove Neyman-Pearson fundamental lemma.
26. Obtain the likelihood ratio test for testing the equality of means of two normal populati with equal variances.
27. Derive the expression for OC function in SPRT. Obtain the OC function correspondin the SPRT for testing $H_0: \mu = \mu_0$ against $H_1: \mu = \mu_1$ $(\mu_1 > \mu_0)$ based on observations fro $N(\mu,\sigma^2)$, where σ^2 is known.
28. (a) Define maximal invariant.

    (b) Let T(X) be maximal invariant with respect to G. Show that the test ϕ is invariant under G if and only if ϕ is a function of T.

(2x4=8 Weight

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1M3N17117 (Pages : 2) Reg. No:.............................

Name:.................................

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester M.Sc Degree Examination, November 2017

ST3E02 - Econometric Models

(2016 Admission onwards)

Max. Time: 3 hours Max. Weightage:36

PART-A

Answer all Questions

Each question carries a weightage of 1.

1. Explain the demand, revenue and cost functions.
2. What is homogeneous production function?
3. What do you mean by forecasting?
4. What do you mean by lagged variables? What are their uses in econometric modelling?
5. Distinguish between white noise process and iid noise process.
6. Define MA(q) model.
7. Define stationary process. What is the stationary condition of an AR(1) model?
8. State the properties of auto-covariance function.
9. What is 95% confidence interval for β_1 in the regression model $Y = \beta_0 + \beta_1 X + u$?
10. What is the significance of β_1 in the regression model $Y = \beta_0 + \beta_1 X + u$?
11. In the regression model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + u$ how will test the significance of the restriction $\beta_1 = \beta_2$? State the assumptions under which the test is valid.
12. Explain the use of F test in assessing the efficacy of the fitted regression model.

(12 × 1 = 12 Weightage)

PART B

Answer eight Questions

Each question carries a weightage of 2.

13. Explain elasticity of substitution.

14. Given the production function $Q = AK^{\alpha}L^{\beta}$, show that

    i) $\alpha + \beta > 1$ implies increasing returns to scale.

    ii) $\alpha + \beta < 1$ implies decreasing returs to scale.

15. How many factors of production are explicitly considered in the Domar model? What does this imply with regard to the capital-labour ratio in production?

16. Explain the Koyck's distributed lag model.

17. Show that the OLS estimate of $\hat{\beta}$ in $Y = X\beta + U$ is unbiased.

18. Distinguish between coefficient determination R^2 and adjusted R^2.

19. Define stationarity of stochastic processes.

20. Explain the indirect least square method of estimation.

21. Write a short note on full information maximum likelihood.

22. Find the ACF for ARMA(1,1) model.

23. Explin the concept of stationarity.

24. What is the difference, if any, between tests of unit roots and tests of cointegration?

($8 \times 2 = 16$ Weightage

PART-C

Answer two Questions

Each question carries a weightage of 4.

25. Describe the method of least squares for estimating parameters of a simple linea regression model. Establish the properties of the estimators starting the condition required.

26. Discuss the problem of hetroscedasticity. Explain the consequences of using leas square estimates in such situations. What are the remedial measures?

27. What are the problems one encounters in the OLS estimation under adaptiv expectations in the following models?

    (a) Models of agricultural supply.

    (b) Models of hyperinflation.

    (c) Partial adjustment models.

    (d) Error correction models.

28. Explain the meaning of each of the following terms.

    (a) Endogenous variables.

    (b) Exogenous variables.

    (c) Structural equations.

    (d) Reduced-form equations. .

    (e) Recursive systems.

($2 \times 4 = 8$ Weightag

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M3N17118 (Pages : 2) Reg. No:…………………………..

Name: ……………………………

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester M.Sc Degree Examination, November 2017

ST3E09 - Life Time Data Analysis

(2016 Admission onwards)

Max. Time: 3 hours Max. Weightage:36

Part A

(Answer ALL the questions. Weightage 1 for each question)

1. Explain the objectives of lifetime data analysis and its present-day relevance.
2. If the hazard rate is given by $h(t)=a+bt$, $t>0$, obtain the expression for the survival function.
3. What is a mixture model? Give an example.
4. Define log-location scale family and give an example.
5. Explain the term 'censored observations'.
6. What is the use of P-P plot in model diagnostics?
7. What are the approaches to regression modeling for lifetimes? Explain.
8. Explain the concept of partial likelihood for inference on lifetime.
9. What is accelerated life model?
10. What is a proportional hazard (PH) model?
11. Distinguish between fully parametric and semi-parametric regression for failure rate.
12. Define the hazard rate in the bivariate set up.

(12x 1=12 weightage)

Part B

(Answer any EIGHT questions. Weightage 2 for each question)

13. Present log-logistic distribution as a parametric model for continuous lifetime and highlight its important analytic characteristics.

14. Describe the basic reliability concepts with reference to discrete lifetime.

15. Writing the expression for the hazard function, describe its behavior for the two-parameter lognormal distribution.

16. Describe the different types of censoring used in lifetime data analysis.

17. Obtain the Greenwood formula for the variance of the KPML estimator.

18. What is a life table? Describe the standard life table methods.

19. Explain Nelson-Aalen estimate and obtain its asymptotic variance.

20. Employing the maximum likelihood method, obtain the estimate of the parameter θ c the life distribution with pdf, $f(t)= (1/\theta) \exp\{-t/\theta\}, t>0 \ (\theta>0)$ under right censoring.

21. Explain the likelihood based inference procedures for Weibull distribution for censored observations.

22. Give the physical interpretation of PH model and identify a model which belongs to this category.

23. How do you apply rank test for censored observations? Explain.

24. Explain the linear rank test in accelerated life models.

(8 x 2 =16 weightag

Part C

(Answer any TWO questions. Weightage 4 for each question)

25. Describe the Weibull model in the context of survival analysis and discuss propertie of its hazard rate.

26. Explain the Kaplan Meier Product Limit (KPML) estimator and mention its importa properties.

27. Obtain the maximum likelihood estimators for the mean of the exponential distribution under Type I and Type II censoring.

28. Derive the expression for the partial likelihood function and describe the test for significance of the regression coefficients in the Cox proportional hazard model, wl there is a single covariate.

(2 x 4=8 weighta