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OPSC OAS
(Mains)
Previous Year Paper
(Statistics-II) 2020

CSM – 69/20
Statistics
Paper – II

Time : 3 hours

Full Marks : 300

The figures in the right-hand margin indicate marks.

Candidates should attempt Q. No. 1 from

Section – A and Q. No. 5 from Section – B

which are compulsory and any three of

the remaining questions, selecting

at least one from each Section.

SECTION – A

1. Answer any three of the following :

   (a) Explain the rational of (i) np chart and (ii) C-chart. Describe how do you construct any one of these two charts. What are the salient differences between these two charts ? 20

(b) (i) Define the following :—

(A) Survival function

(B) Hazard function

(ii) Derive the Hazard function of the following distributions :

(A) Two parameter weibull

(B) Rayleigh

Examine whether Weibull distribution belongs to IFR class. 20

(c) Describe the ARIMA model. Define ACF and PACF. Describe how do you determine the order of autoregressive moving average component ? 20

(d) Derive the role of the following agencies : 20

(i) CSO

(ii) Cesus office

(iii) NSSO

(iv) Bureau of economics and statistics

2. (a) Describe single, double and sequential sampling plans for attributes. Derive the OC function for any one of the plans. 20

(b) (i) With the example distinguish between :

(A) Truncation and censoring

(B) Type-I and type-II censoring

(ii) When the failure time follows exponential distribution, derive the maximum likelihood estimator (MLE) of the parameter under type-I censoring. 20

(c) Explain the components of a time series and distinguish between additive and multiplicative time series model. Describe any one of the procedure for eliminating the (i) trend (ii) cyclic Component of the time series. 20

3. (a) What is cost of living index number ? Explain any two methods of constructing this index number. 20

(b) In linear model $Y = X\beta + \varepsilon$, derive the least square estimator of β when $X'AX$ is of full rank. Show that this is an unbiased estimator.

20

(c) What do you understand by multicollinearity ? What are the consequences of multicollinearity ? Describe any one procedure of handling multicollinearity. 20

4. (a) What is autocorrelation ? Describe any one procedure for detecting first order autocorrelation. How do you handle the first order autocorrelation ? 20

(b) Describe the method of collection of official statistics on trade and prices. Comment of their limitations and reliability. 20

(c) Derive how agriculture census is conducted in India. Name the publication relating to agriculture census. 20

SECTION – B

5. Answer any three of the following :

(a) Derive simplex procedure of solving LPP.

20

(b) Derive storage models with reference to dam type.
20

(c) Derive how do you construct abridged life table using vital rates.
20

(d) Explain what do you understand by factor analysis ? Explain its uses in psychometry.

20

6. (a) Describe two person zero sum game. Indicate any real life application of this game.

20

(b) Explain BIG M procedure of solving LPP. Indicate its advantages over simplex procedure.
20

(c) Define Transition Probability Matrix (TPM). Discuss classification of states of TPM and the associated Ergodic theorem.
20

7. (a) Discuss the various fertility reproduction rates. 20

    (b) Describe the components of a life table and its uses. Discuss how do you construct cause specific life table. 20

    (c) For an M/M/1: (α / FIFO), state the steady state difference equations and hence obtain the probability distribution under steady state. 20

8. (a) Define the following and describe the limitations and their uses in psychometry. 20

    (i) Z-scores

    (ii) Standard scores

    (iii) T-scores

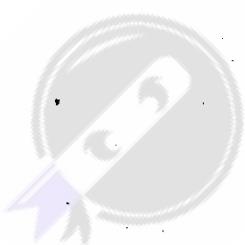   (iv) Percentile scores

    (b) With reference to factor analysis, describe the following : 20

    (i) Procedure for identifying the optimum number of factors

(ii) Rotation of factors and their uses

(iii) Communality and factor scores

(c) Explain what do you understad by path analysis ? How the path coefficients are different from regression coefficients ?   20

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