VERBAL REASONING FOR APTITUDE TEST

Credits: 2

Theory: 2 hours/week   **Marks - 50**

Unit – I NUMBERS AND DIAGRAMS

1.1 Series Completion: Number series, Alphabet Series
1.2 Series Completion: Alpha Numeric Series, Continuous Pattern Series

1.3 Logical Venn Diagrams

1.4 Mathematical Operations: Problem solving by substitution, Interchange of signs
   and numbers

Unit – II ARITHMETICAL REASONING

2.1 Mathematical Operations: Deriving the appropriate conclusions

2.2 Arithmetical Reasoning: Calculation based problems, Data based problems

2.3 **Arithmetical Reasoning**: Problems on ages, Venn diagram based problems

2.4 Cause and Effect Reasoning

Text Book: A Modern Approach to Verbal & Non-Verbal Reasoning by
             Dr. R.S.Aggarwal

PUBLIC HEALTH AND HYGIENE
Credits: 2

Theory :   hours/week   **Marks:**

UNIT – I : NUTRITION AND ENVIRONMENT

1.1 Balanced diet and Malnutrition.

1.2 Nutritional deficiencies and disorders- Carbohydrates, proteins, lipids, vitamins and

 minerals.

1.3 Occupational, Industrial, agricultural and urban Health-Exposure at work place, urban areas, industrial workers, farmers and agricultural labourers, Health workers and health disorders and diseases.

1.4 Environmental pollution and associated Health hazards, Water borne diseases and Air borne diseases.

UNIT-II : DISEASES AND HEALTH CARE

2.1 Causes, Symptoms, Diagnosis, Treatment and Prevention - Malaria, Filaria, Measles,

 Polio, Chicken pox, Rabies, Plague, Leprosy,.

2.2 Causes, Symptoms, Diagnosis, Treatment and Prevention of non communicable diseases - Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Mental ill-health.

2.3 Health care legislation in India – Termination of pregnancy act, Maternity benefit act, Biomedical waste act, ESI act.

2.4 First Aid and Health awareness, personal health care record maintenance.

Applied Statistics-1

Unit-I

Design of Sample Surveys: Concepts of population, sample, sampling unit, parameter, statistic, sample frame and standard error. Principal steps in sample surveys - Need for sampling, Census versus Sample surveys, sampling and non- sampling errors, sources and treatment of non-sampling errors, advantages and limitations of sampling, Subjective, probability and mixed sampling methods. Methods of drawing random samples with and without replacement.

Unit-II

Types of sampling: Estimates of population mean, total, and proportion, their variances and the estimates of variances in (i) SRS(wr) and SRS(wor). (ii) Stratified random sampling with proportional and Neyman allocation (iii) Systematic sampling when $N = nk$. Comparison of relative efficiencies. Advantages and disadvantages of above methods of sampling.

Unit-III

Time series: Time series and its components with illustrations, additive, multiplicative and mixed models. Determination of trend by least squares, moving average methods. Growth curves and their fitting with reference to Modified exponential, Gompertz and Logistic curves. Determination of seasonal indices by Ratio to moving average, ratio to trend and link relative methods.

Unit-IV

Index Numbers: Concepts, construction, uses and limitations of simple and weighted index numbers. Laspeyer's, Paasche's and Fisher's index numbers, criterion of a good index numbers, problems involved in the construction of index numbers. Fisher's index as ideal index number. Fixed and chain base index numbers. Cost of living index numbers and wholesale price index numbers. Base shifting, splicing and deflation of index numbers.

List of reference books:
1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand & Sons.

2. Parimal Mukhopadhyay : Applied Statistics, New Central Book agency.

3. Daroga Singh and Chowdhary: Theory and Analysis of Sample survey designs, Wiley Eastern.

4. M.R.Saluja : Indian Official Statistics, ISI publications.

5. S. P. Gupta : Statistical Methods, Sultan Chand & Sons.

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Applied Statistics-1 Practical

Sampling Techniques:

1. Estimation of Population mean, population total and variance of these estimates by SRS (wr) and SRS(wor).

2. Comparison between SRS(wr) and SRS(wor).

3. Stratified random sampling with proportional and optimum allocations.

4. Comparison between proportional and optimum allocations with SRS(wor).

5. Systematic sampling with $N = nk$.

6. Comparison of Systematic sampling with Stratified and SRS(wor).

Time Series Analysis:

7. Measurement of trend by method of least squares.

8. Measurement of trend by method of moving averages.

9. Determination of seasonal indices by the method of Ratio to trend.

10. Determination of seasonal indices by the method of Ratio to moving averages.

11. Determination of seasonal indices by the method of link Relatives.

Index Numbers:

12. Computation of all weighted indices.

13. Computation of Cost of living index number.

14. Base shifting, splicing and deflation of Index numbers.

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Elective-I

(A): SQC and LPP

Unit-I

Statistical Quality Control: Importance of SQC in industry, Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np and c- charts with fixed and varying sample sizes), Interpretation of control charts. Natural tolerance limits and specification limits, process capability index, Concept of Six Sigma limits and its importance.

Unit-II

Acceptance sampling plans: Concept of AQL and LTPD, Producer's risk and consumer's risk Single and Double sampling plans for attributes and their OC and ASN functions. Design of single and double sampling plans for attributes using Binomial and Poisson distributions.

Unit-III

Linear Programming: Meaning and scope of OR, Convex sets and their properties, Definition of general LPP, Formulation of LPP, Solution of LPP by graphical method, Fundamental theorem of LPP, Simplex algorithm, Concept of artificial variables, Big –M (Penalty) method, two-phase simplex methods, Concept of degeneracy and resolving it.

Unit-IV

Duality: Concept of duality, duality in LPP, dual -primal relationships, fundamental theorem of duality, dual simplex method with simple examples.

List of reference books:

1. Kanti Swaroop, P.K.Gupta and Man Mohan: Operations Research, Sultan Chand.
2. D. C. Montgomary: Introduction to Statistical Quality Control, Wiley.
3. V.K.Kapoor and S.C.Gupta: Fundamentals of Applied Statistics, Sultan Chand.
4. S. I. Gauss: Linear Programming, McGraw hill.
5. Hadley : Linear programming, Addison-Wesley.
6. Wayne L. Winston : Operations Research, Thomson, India edition (4th edition).
7. Parimal Mukhopadhyay : Applied Statistics, New Central Book agency.
8. R. C. Gupta: Statistical Quality Control.
9. Taha: Operations Research-An Introduction, Mac Millan.

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Elective-I

(A): SQC and LPP Practical
(Practical using MS-Excel and TORA)

Statistical Quality Control and Acceptance Sampling Plans:

1. Construction of $\overline{X}$, R and †- charts.

2. Construction of p and np charts with fixed n.

3. Construction of p and np charts with varying n.

4. Construction of c and u charts.

5. Construction of OC and ASN curves for single and double sampling plan.

Operations Research:

6. Conversion of LPP from one form to another.

7. Solution of LPP by Graphical method.

8. Solution of LPP by simplex method.

9. Solution of LPP by Big-M and two-phase simplex method.

10. Duality problems of LPP.

11. Solution of LPP by dual simplex method.

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Elective-I

(B): Bio Statistics-1

Unit-I

Bioassay: The purpose and structure of biological assay. Types of biological assays, direct assays, Ratio estimates, asymptotic distributions: Feller's theorem. Regression approach to estimating dose-response, relationships.

Unit-II

Logit and Probit approaches when dose-response curve for standard preparation is unknown, quantal responses, methods of estimation of parameters, estimation of extreme quantiles, dose allocation schemes, polychotomous quantal response, estimation of points on the quantal response function**.**

Unit-III

Statistical Genetics: Basic terminology of genetics. Frequencies of genes and genotypes, Mendal's law.

Unit-IV

Hardy-Weinberg equilibrium. Mating Frequencies, estimation of allele frequency (dominant /co dominant cases). Multiple alleles. Approach to equilibrium for X-linked gene, natural selection, mutation, genetic drift, equilibrium when both natural selection and mutation are operative.

List of reference books:

1. D. J. Finney (1970): Statistical Methods in Biological Assay, Charles Griffin.
2. Z. Govindarajulu (2000): Statistical Techniques in Bioassay, Karger Publishers/ Panther Publishers.
3. C. C. Li (1976): First course in Population Genetics, Boxwood press, California.
4. Falcon and Mackay (1998): Introduction to Quantitative Genetics. Longman.
5. D. R. Cox and Oakes. D (1984): Analysis of Survival data, Chapman and Hall.
6. R.G. Miller (12981): Survival Analysis, John Wiley.
7. Anil Gore and S. A. Paranjpe (2000): A course in Mathematical and Statistical Ecology, Kulwer Academic Publishers.
8. E.C. Rielon (1977): An Introduction to Mathematical Ecology, Wiley.

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Elective-I

(B): Bio Statistics-1 Practical

1. Estimation of relative potency and its standard error.

2. Fitting exponential growth model to data by linearization method.

3. Fitting logistic growth model.

4. Dose response relation and its estimation by least squares method.

5. Dose response relation and estimation by MLE method.

6. Estimation of extreme quantiles.

7. Estimation of points on the quantal response.

8. Hardy –Weinberg equilibrium frequencies.

9. Estimation of allele frequencies.

10. Effects of mutation and selection.

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Elective-I

(C): Actuarial Statistics-1

Unit-I

Utility theory, insurance and utility theory, models for individual claims and their sums, survival function, curate future lifetime, force of mortality.

Unit-II

Life table and its relation with survival function examples, assumptions of fractional ages, some analytical laws of mortality select and ultimate tables.

Unit-III

Multiple life functions, joint life and last survivor status, insurance and annuity benefits through multiple life functions, evaluation for special mortality laws.

Unit-IV

Multiple decrement models, deterministic and random survivorship groups, associated single decrement tables, central rates of multiple decrement, net single premiums and their numerical evaluations.

List of Reference books:

1. N. L. Bowers, H. U. Gerber, J. C. Hickman, D .A. Jones and C .J. Nesbitt (1986):

   Actuarial Mathematics, (Society of Actuaries), Ithaca, Illinois, USA.

2. Neill, A. (1977): Life Contingencies, Heineman.

3. Spurgeon E.T. (1972): Life Contingencies, Cambridge University Press.

4. Benjamin, B and Pollard, J.H.(1980): Analysis of Mortality and other Actuarial Statistics.

5. Mathematical basis of Life Assurance:(F.I. 21): Federation of Insurance Institutes study

   courses, Bombay).

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Elective-I

(C): Actuarial Statistics-1 Practical

1. Computation of values of utility function.

2. Computation of various components of life tables.

3. Construction of multiple decrement table for deterministic survival group.

4. Determination of distribution function, survival function and force of mortality.

5. Construction of multiple decrement table for random survivorship group.

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