MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF JUNIOR GRADE OF MIZORAM PLANNING, ECONOMICS & STATISTICAL SERVICE
OCTOBER, 2015

STATISTICS
PAPER – I

Time Allowed : 3 hours | Full Marks : 100

Figures in the margin indicate full marks for the questions.

PART – A (10×2=20)

Attempt all questions.

1. The data, which are collected from the units or individual respondents directly for the purpose of certain study or information, are known as
   (a) secondary data
   (b) primary data
   (c) ordinal data
   (d) cardinal data

2. The point of intersection of the less than and greater than Ogive corresponds to
   (a) Geometric mean
   (b) Median
   (c) Harmonic mean
   (d) Mean

3. Mean of 100 observations is 50 and standard deviation is 10. After adding 5 to each observation, the new mean is
   (a) 50
   (b) 45
   (c) 55
   (d) 15

4. A and B are two independent events such that $P(A^c)=0.7$, $P(B^c)=k$ and $P(A \cup B)=0.8$, then the value of k is:
   (a) 5/7
   (b) 1
   (c) 2/7
   (d) 1/7

5. Let the random variable $X \sim B(5,p)$ such that $P(X=2) = 2P(X=3)$. Then, the variance of X is
   (a) 1/9
   (b) 9/10
   (c) 10/9
   (d) 1/10

6. Let $X_1, X_2, \ldots, X_8$ be i.i.d $N(0, \sigma^2)$ random variables. Further, let $U = X_1 + X_2$ and $V = \sum_{i=1}^{8} X_i$, the correlation coefficient between U and V is

(a) 1/3 (b) 1/2

(c) 1 (d) 0

7. Pearson's correlation coefficient (r) is lies between:

(a) $0.2 < r < 2$ (b) $-1 \le r \le 1$

(c) $0 < r < 1$ (d) None of these

8. Which of the following is not present in a time series?

(a) Seasonality (b) Operational variations

(c) Trend (d) Random variations

9. The Laspeyres and Paasche index are examples of

(a) Aggregate index numbers (b) Weighted price index only

(c) Weighted index numbers (d) Weighted quantity index only

10. Records of births, deaths, marriages, and divorces, gathered through a registration system maintained by governmental units, are referred to as

(a) A census. (b) Demography.

(c) Vital statistics. (d) None of these

B (Short Answer Type) 5×4=20

11. For a certain distribution, the mean is 10, variance is 16, γ_1 is +1 and β_2 is 4. Find the first four moments about the origin.

12. Define weighted average and show that algebraic sum of deviation around mean is zero.

13. What do you meant by partial correlation coefficient? Write down the formulae for $R_{1.23}$ and $r_{12.3}$.

14. Define crude death rate (CDR) and age specific death rate (ASDR).

15. A car has four traffic lights on its route. Each of them allows it to move ahead or stop with Probability 0.5. If X represents the number of lights passed before the car stops the first time, then show that $P(X = 3) > P(X = 4)$.

C (Long Answer Type) Attempt any six of the followings (6×10=60)

16. What are the different measures of central tendency? Explain each with their merits and demerits.

17. What is an index number? Describe briefly the problems that are involved in the construction of an index number of prices. Also describe the criteria of Good Index Number.

18. Can $Y = 5 + 2.8X$ and $X = 3 - 0.5Y$ be the estimated regression equations of Y on X and X on Y respectively? Explain your answer with suitable theoretical arguments. Also show that if one of the regression coefficients is greater than unity, the other must be less than unity.

19 (a) Define correlation coefficient and show that it is independent of change of origin and scale.

(b) Explain the meaning of skewness and kurtosis. Also mention the nature of the curve if β_2 is equal to 3 and greater than 5.

20. If the correlation between the price relatives X and the quantity relatives Y is positive (negative), then prove that Laspeyre's index is less (greater) than Paasche's index.

21. Explain the meaning of time series and also mention its important uses. What are the different methods for measurement of trend in time series?

22. Describe the nature of the component of a time series. Explain the additive and multiplicative models of a time series stating clearly the assumptions and discuss their relative merits.

23. Write short notes on *any four (4)*

(a) Infant Mortality
(b) Seasonal Variation
(c) Method of Semi-Averages
(d) Growth Curves
(e) T-Statistic
(f) Moment Generating Functions

24. Define probability density function. Check the given function is a probability density function. Hence, find its mean and variance.

$f(x) = 6x(1-x)\ ;0 \leq x \leq 1$

25. Prove that for n events $A_1, A_2, \ldots, A_n$, we have

$$P\left(\bigcup_{i=1}^{n} A_i\right) = \sum_{i=1}^{n} P(A_i) - \sum\sum_{1 \leq i < j \leq n} P(A_i \cap A_j) + \ldots + (-1)^{n-1} P(A_1 \cap A_2 \cap \ldots \cap A_n)$$

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