Model Question Paper-I
Ph. D. Entrance Test
STATISTICS
(Objective)

Time : 01 hour **M.M. : 100**

1. The incidence of occupational disease in an industry is such that the workmen have a 20% of chance of suffering from it. What is the probability that out of six workmen, 4 or more will contact the disease?
   (a) 0.015 (b) 0.017 (c) 0.019 (d) 0.15

2. The mean and variance of a binomial distribution are 8 and 4, respectively then, P(X=1) is equal to
   (a) $\frac{1}{2^{12}}$ (b) $\frac{1}{2^4}$ (c) $\frac{1}{2^6}$ (d) $\frac{1}{2^8}$

3. 800 employees of a company are covered under the medical group insurance scheme. Under the term of coverage, 40 employees are identified as belonging to 'high risk' category. If 50 employees are selected are random, what is the probability that at the most two are in the high risk category?

   (a) 0.644 (b) 0.549 (c) 0.744 (d) 0.844

4. In an intelligent test administered to 1000 students, the average score was 42 and standard deviation 24. Find the number of students securing between 30 and 54.
   (a) 384 (b) 373 (c) 363 (d) 393

5. If a random variable X has the following probability distribution

X:	-1	-2	1	2
P(X):	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$

   then the expected value of X is:
   (a) $\frac{3}{2}$ (b) $\frac{1}{6}$ (c) $\frac{1}{2}$ (d) none of these

6. Normal distribution was invented by
   (a) Laplace (b) De-Moivre (c) Gauss (d) None of these

7. A population is distributed as N ~ (μ, 10.24). A sample of 576 items has a mean 4.7. The value of the statistic Z to test H_0: $\mu = 5.2$ is
   (a) 3.75 (b) 28.125 (c) -3.75 (d) none of these

8. To test an hypothesis about proportions of items in a class, the usual test is
   (a) t-test (b) F-test (c) Z-test (d) none of these

9. Two samples of size 10 and 8 had sample means 18 cm and 12 cm with variance 25 and 16. Supposing that the samples have been drawn from normal populations $N(\mu_1, \sigma_1^2)$ and $N(\mu_2, \sigma_2^2)$, the value of statistic-t for testing H_0: $\mu_1 = \mu_2$ under $\sigma_1^2 \neq \sigma_2^2$ is
(a) 2.67 (b) 2.75 (c) 1.33 (d) 2.83

10. A manufacturer claims that his items could not have a large variance. 18 of his items have a variance 0.033. The value of statistic χ^2 to test H_0: $\sigma^2 = 1$ is
(a) 30.30 (b) 5.55 (c) 0.56 (d) none of these

11. A coin is tossed 400 times and it turns up head 216 times. The hypothesis that the coin is unbiased can be tested by
(a) χ^2 test (b) Z-test (c) both (a) & (b) (d) neither (a) nor (b)

12. To construct the confidence interval for the population variance, we should use the
(a) Normal distribution (b) t-distribution
(c) F-distribution (d) chi-squre distribution

13. Significance of a regression coefficient can be tested by
(a) t-test (b) F-test (c) both (a) & (b) (d) neither (a) nor (b)

14. If the correlation between the variables X and Y is 0.5, then the correlation between the variables 2x-4 and 3-2y is:
(a) 1 (b) 0.5 (c) -0.5 (d) 0

15. If ρ is the simple correlation coefficient, the quantity ρ^2 is known as
(a) coefficient of determination
(b) coefficient of non-determination
(c) coefficient of alienation
(d) none of these

16. If X_1, X_2 and X_3 are three variables, the partial correlation between X_2 and X_3 eliminating the effect X_1 in terms of simple correlation coefficients is given by the formula

(a) $r_{23.1} = \dfrac{r_{23} - r_{12}r_{13}}{\sqrt{\left(1 - r_{12}^2\right)\left(1 - r_{13}^2\right)}}$ (b) $r_{23.1} = \dfrac{r_{32} - r_{21}r_{31}}{\sqrt{\left(1 - r_{21}^2\right)\left(1 - r_{31}^2\right)}}$

(c) $r_{23.1} = \dfrac{r_{32} - r_{12}r_{13}}{\sqrt{\left(1 - r_{12}^2\right)\left(1 - r_{13}^2\right)}}$ (d) none of these

17. If the rank correlation coefficient between marks in management and mathematics for a group of students is 0.6 and the sum of squares of the differences in ranks is 66. What is the number of students in the group?
(a) 10 (b) 9 (c) 8 (d) 11

18. Given the expected values for variables X and Y as $E(X) = 2$, $E(X^2) = 10$, $E(Y) = 3$, $E(Y^2) = 20$ and $E(XY) = 16$ we conclude that
    (a) correlation coefficient will be positive
    (b) correlation coefficient will be negative
    (c) expected values are incompatible
    (d) none of these

19. You are given a box with 20 cards in it. 10 of these cards have the letter I printed on them. The other 10 have the letter T printed on them. If you pick up 3 cards at random and keep them in the same order, the prob. of making the word IIT is
    (a) 9/80 (b) 1/8 (c) 4/27 (d) 5/38

20. Six faces of an unbiased die are numbered with 2,3,5,7,11 and 13. If two such dice are thrown, then the probability that the sum on the uppermost faces of the dice is an odd number is
    (a) 5/18 (b) 5/36 (c) 13/18 (d) 25/36

21. An urn A contains 5 white and 3 black balls and urn B contains 4 white and 4 black balls. An urn is selected and a ball is drawn from it, the probability that the ball is white, is
    (a) $\frac{9}{8}$ (b) $\frac{9}{16}$ (c) $\frac{5}{32}$ (d) $\frac{5}{16}$

22. A fair coin is tossed repeatedly unless a head is obtained, the probability that the coin has to be tossed at least four times is
    (a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{6}$ (d) $\frac{1}{8}$

23. A SRS of size 10 is drawn without replacement from a universe containing 85 units. If the mean and S.D as obtained from the sample are 90 and 4 respectively. What is the estimate of the standard error of sample mean?
    (a) 0.58 (b) 1.26 (c) 0.67 (d) 0.72

24. Variance of $\bar{x}_{st}$ under random sampling, proportional allocation and optimum allocation hold the correct inequality as
    (a) $V_{ran}(\bar{x}_{st}) \leq V_{prop}(\bar{x}_{st}) \leq V_{opt}(\bar{x}_{st})$
    (b) $V_{ran}(\bar{x}_{st}) \geq V_{opt}(\bar{x}_{st}) \geq V_{prop}(\bar{x}_{st})$
    (c) $V_{ran}(\bar{x}_{st}) \geq V_{prop}(\bar{x}_{st}) \geq V_{opt}(\bar{x}_{st})$
    (d) none of these

25. Under proportional allocation, the size of the sample from each stratum depends on
    (a) total sample size (b) size of stratum (c) population size (d) all of these

26. In Simple random sampling with replacement, the same sampling unit may be included in the sample:
(a) only once (b) only twice
(c) more than once (d) none of these

27. Local control is a device to maintain
(a) homogeneity among blocks (b) homogeneity within blocks
(c) both (a) & (b) (d) neither (a) nor (b)

28. Missing observation in a CRD is to be
(a) estimated (b) deleted (c) guessed (d) none of these

29. A randomized block design has
(a) two - way classification (b) one - way classification
(c) three - way classification (d) no classification

30. While analyzing the data of a k×k Latin square, the error d.f. in analysis of variance is equal to
(a) (k-1) (k-2) (b) k (k-1) (k-2) (c) k^2-2 (d) k^2-k-2

31. Trend in a time series means:
(a) long-term regular movement (b) short-term regular movement
(c) both (a) and (b) (d) neither (a) nor (b)

32. If the trend line with 1975 as origin is Y = 20.6 + 1.68X, the trend line with 1971 as origin is:
(a) Y = 20.6 + 6.72 X (b) Y = 13.88 + 1.68 X
(c) Y = 34.61 + 1.68 X (d) none of these

33. Linear trend of a time series indicates towards:
(a) constant rate of change (b) constant rate of growth
(c) change in geometric progression (d) all the above

34. Seasonal variation means the variations occurring within:
(a) a number of years (b) parts of a year
(c) parts of a month (d) none of the above

35. If an estimator T_n of population parameter θ converges in probability to θ as n tends to infinity is said to be
(a) sufficient (b) efficient (c) consistent (d) unbiased

36. A sufficient statistic
(a) is consistent
(b) is unbiased
(c) uses all information a sample contains about the parameter to be estimated.
(d) is always efficient

37. The idea of testing of hypothesis was first set forth by
(a) R. A. Fisher (b) J. Neyman (c) E. L. Lehman (d) A. Wald

38. Critical region of size α which minimized β amongst all critical regions of size α is called
(a) powerful critical region (b) minimum critical region
(c) best critical region (d) worst critical region

39. In simplex table of a maximization LPP the column corresponding to a variable x_j is $(2; -1, 0, -3)^T$. The $z_j - c_j = 2$ is not most negative. Then
(a) the solution is unbounded (b) the solution is bounded
(c) the solution may be bounded or unbounded (d) none of these

40. If in a simplex table, there is a tie in the leaving variable, then
(a) the next BFS will be non – degenerate BFS
(b) the next BFS will be degenerate BFS
(c) the next BFS will be optimal
(d) none of these

41. The north – west corner rule is used to find
(a) initial feasible solution (b) an optimal solution
(c) non – optimal solution (d) none of these

42. In a transportation problem (TP) the dual variables u_i and u_j are unrestricted in sign because
(a) the TP is a minimization problem
(b) the TP is with all equality constraints
(c) in TP all decision variables are ≥ 0
(d) none of these

43. The arrival of customers (with no departure) in system, in Queueing theory can be stated as
(a) the pure birth process (b) the pure death process
(c) both (a) & (b) (d) neither (a) nor (b)

44. If arrival rate is 3 customers/day and service rate is 5 customers/day for M/M/1 queueing systems. The expected number of customers in the system at certain day is
(a) 1.5 (b) 2 (c) 3 (d) 5

45. If the interarrival time is exponential with mean $1/\lambda$ then the number of arrivals in (0, t) is
(a) poisson distributed (b) exponential distributed
(c) binomial distributed (d) none of these

46. Under memoryless property, the arrival of the customer is independent of
(a) previous arrival (b) future arrival
(c) state of system (d) none of these

47. Age-specific mortality rates fail to reveal:
(a) mortality conditions (b) age distribution of persons
(c) sex ratio (d) all the above

48. Fertility rates mainly depend on:
(a) total female population (b) total population
(c) female population of child bearing age (d) number of newly borned babies

49. Fertility rate provide an adequate basis for:
(a) population growth (b) family planning
(c) checking the infant mortality (d) all the above

50. If P_1 and P_2 are the populations at an interval of 10 years, the population just after five years will be:

(a) $\frac{1}{2}(P_1 + P_2)$ (b) $\sqrt{P_1 \times P_2}$ (c) $\frac{1}{2}\left(\frac{1}{P_1} + \frac{1}{P_2}\right)$ (d) $\sqrt{P_1 + P_2}$