STATISTICS

Option I

1. If $X \sim N(8, 64)$, the standard normal deviate Z will be :

   (a) $Z = \frac{X - 8}{64}$

   (b) $Z = \frac{X - 8}{8}$

   (c) $\frac{X - 64}{8}$

   (d) None of the above

2. If the students on a boat have three red flags, four yellow flags and two blue flags to arrange on a vertical pole, the number of possible signals is :

   (a) 210

   (b) 1260

   (c) 1356

   (d) 496

3. Given that $P(A) = 0.7$, $P(B) = 0.3$ and $P(A \cap B) = 0.2$, then $P(A/B)$ is equal to :

   (a) 2/3

   (b) 5/6

   (c) 2/7

   (d) 1/3

4. A variable represents temperature recorded every half hour at a weather bureau. The variable is :

   (a) Discrete

   (b) Continuous

   (c) Bivariate

   (d) Complex

5. Standard error of sample mean (for large n) is given by :

(a) $\frac{\sigma}{n}$

(b) $\frac{\sigma^2}{\sqrt{n}}$

(c) $\frac{\sigma^2}{n}$

(d) None of the above

6. A random variable X has the following probability distribution :

x	:	-1	-2	1	2
$p(x)$	:	1/3	1/6	1/6	1/3

Then E(X) is equal to :

(a) 3/2

(b) 4/6

(c) 11/3

(d) 1/6

7. Which of the following statements is *true* ?

(a) Variance can be negative

(b) Less the S.E., better it is

(c) S.E. is always unity

(d) More the S.E., better it is

8. In order to assess the expenditure pattern of the university employees, a random sample of 300 hundred employees is to be taken. Then which of the following sampling methods will be the most suitable method to be used for drawing samples :

(a) Simple Random Sampling (SRS)

(b) Systematic Sampling

(c) Stratified Sampling

(d) Clustering Sampling

9. For a set of observations, $\overline{X} = 15$ and $\sigma = 6$. If all the observations are multiplied by 2, then the resulting mean and σ will be :

(a) $\overline{X} = 30, \sigma = 12$

(b) $\overline{X} = 15, 12$

(c) $\overline{X} = 30, \sigma = 6$

(d) None of the above

10. Consider the following LPP :

Max $Z = 5x_1 + 4x_2$

Sub to :

$$6x_1 + 10x_2 \leq 16$$

$$2x_1 + 15x_2 \leq 17$$

$$x_1, x_2 \geq 0$$

A feasible solution to the above LPP is given by :

(a) $(x_1 = 2, x_2 = 1)$

(b) $(x_1 = 2, x_2 = 2)$

(c) $(x_1 = 1, x_2 = 9)$

(d) $(x_1 = 1, x_2 = 0)$

11. Let $X \sim N(\mu, \sigma^2)$ and μ is unknown. If μ is estimated by the sample mean $\bar{x} = \Sigma x_i / n$, then $\bar{x}$ is an :

(a) estimator

(b) estimate

(c) optimal value

(d) none of the above

12. Which of the following is *not* the property of a good estimator ?

(a) Unbiasedness

(b) Sufficiency

(c) Efficiency

(d) MLE

13. For what value of K, the following is distribution :

$$dF = kx^2e^{-x}dx,\ 0 < x < \infty.$$

(a) 1/3

(b) 1/2

(c) 1/4

(d) None of the above

14. If 3 of 20 tyres in storage are defective and four of them are randomly chosen for inspection, then what is the probability that one of the defective tyres will be included ?

(a) 4/9

(b) 17/25

(c) 8/19

(d) 13/69

15. For a distribution, the mean is 10, variance is 16, $\mu_3 = 64$, then the distribution is :

(a) symmetrical

(b) negatively skewed

(c) moderately positively skewed

(d) none of the above

16. If $\bar{x}$ is used as an estimate of μ, we can be $(1 - \alpha)$ 100% confident that the error will not exceed a specified amount e when the sample size is given by :

(a) $\left(\frac{Z_\alpha \sigma}{e}\right)$

(b) $\frac{(Z_{\alpha/2} \sigma)^2}{e}$

(c) $\left(\frac{Z_\alpha \sigma}{e}\right)^{1/2}$

(d) $\left(\frac{Z_{\alpha/2} \sigma}{e}\right)^2$

17. To find the rate of population growth we use :

(a) G.M.

(b) H.M.

(c) A.M.

(d) Median

18. We make use of which of the following statistics while using Chi-square test for testing independence of attributes :

(a) $\Sigma\Sigma \left(E_{ij} - O_{ij}\right)^2 / E_{ij}^2$

(b) $\Sigma\Sigma \left(E_{ij} - O_{ij} / E_{ij}\right)^2$

(c) $\Sigma\Sigma \left(O_{ij} - E_{ij}\right)^2$

(d) $\Sigma\Sigma \left(E_{ij} - O_{ij}\right)^2 / E_{ij}$

19. If any H_0 is rejected at $\alpha = .05$ level of significance, then :

(a) it will be rejected at $\alpha = .10$

(b) it will be accepted at $\alpha = .10$

(c) it will be rejected at $\alpha = .01$

(d) none of the above

20. If X is a random variable, then the standard deviation of X is equal to :

(a) $\sigma_x = \sqrt{\text{var}(X)}$

(b) $\sigma_x = +\sqrt{\text{var}(X)}$

(c) $\sigma_x^2 = \text{var}(X)$

(d) None of the above

21. Correlation coefficient is independent of change of :

(a) origin

(b) scale

(c) origin and scale

(d) none of the above

22. If $x_1, x_2, \ldots, x_n$ is a random sample from $N(\mu, \sigma^2)$, then $\frac{\overline{X} - \mu}{S/\sqrt{n}}$ is distributed as :

(a) $t_{(n-1)}$

(b) t_n

(c) N(0, 1)

(d) χ_1^2

23. In an ANOVA table, the following information is given : SST = 92.32, df for treatments = 4, SSE = 2332.49, df for error = 35 and $F_{0.05}$ (4, 35) = 5.735, then H_0 :

(a) is accepted

(b) is rejected

(c) may be rejected

(d) may be accepted

24. The geometric mean of Laspeyer's and Paasche's indices is :

(a) Bowley's index

(b) Fisher's ideal index

(c) Marshall and Edgeworth's index

(d) Kelley's index

25. Which of the following is a first type of error ?

(a) Accept H_0 when it is true

(b) Reject H_1 when it is true

(c) Reject H_0 when it is true

(d) None of the above

26. For a Binomial distribution the mean is 6 and standard deviation is $\sqrt{2}$. Then q is equal to :

(a) 2/3

(b) 3/4

(c) 1/3

(d) 4/5

27. In a trivariate distribution, if $r_{12} = 0.7$, $r_{23} = 0.5$ and $r_{31} = 0.5$, then $R_{1.23}$ is equal to :

(a) 0.7211

(b) 0.52

(c) 0.94

(d) None of the above

28. Let $x_1, x_2, \ldots, x_n$ be a random sample from normal population with mean μ and variance σ^2 then which of the following is distributed as N(0, 1) when $n \to \infty$.

(a) $\frac{\overline{X} - \mu}{s/n}$

(b) $\frac{\sqrt{n}}{\sigma}(\overline{X} - \mu)$

(c) $\frac{\overline{X} - \mu}{\sigma^2/n}$

(d) None of the above

29. In a Latin Square Design with one missing observation, the error if in case of 4 treatments will be :

(a) 6

(b) 7

(c) 4

(d) None of the above

30. Which of the following is *not* the method of measuring seasonal variations ?

(a) Moving Average Method

(b) Ratio to Trend Method

(c) Link Relative Method

(d) Principle of Least Squares

31. If X_i $(i = 1, 2, 3, 4)$ are i.i.d. N(0, 1), then $X_1 - X_2$ is distributed as :

(a) N (2, 0)

(b) N (1, 1)

(c) N (0, 2)

(d) None of the above

32. If X ~ Exp (θ), then the variance of X is given by :

(a) $1/\theta$

(b) θ

(c) θ^2

(d) $1/\theta^2$

33. Given (A) = 28, (B) = 38, (AB) = 12 and N = 60. Then A and B are :

(a) negatively associated

(b) positively associated

(c) not associated

(d) independent

34. Sign test is used to test :

(a) Mode

(b) Variance

(c) SD

(d) Median

35. In a fixed effect model, the degrees of freedom for error in a 2^2-factorial experiment (in RBD having r replicates) will be :

(a) $4r - 1$

(b) $4 (r - 1)$

(c) $3 (r - 1)$

(d) $(r - 1)$

36. N.P. Lemma is used to find most powerful critical region for testing :

(a) simple null hypothesis *Vs.* composite alternative hypothesis

(b) simple composite *Vs.* null alternative hypothesis

(c) likelihood

(d) simple null hypothesis *Vs.* simple alternative

37. The hypothesis that the population variance has a specified value can be tested by :

(a) F-test

(b) χ^2-test

(c) Z-test

(d) None of the above

38. Two unbiased dice are thrown. Then the probability that both the dice show the same number is :

(a) 1/6

(b) 5/36

(c) 5/18

(d) None of the above

39. If X and Y are two random variables having joint density function :

$$f(x, y) = \begin{cases} \frac{1}{8}(6 - x - y); \ 0 \le x < 2, \ 2 \le y < 4 \\ 0; \text{ otherwise} \end{cases}$$

then P(X + Y < 3) is equal to :

(a) 3/8

(b) 3/5

(c) 5/24

(d) None of the above

40. The m.g.f. of standard normal variate is given by :

(a) $\mu t + \frac{t^2\sigma^2}{2}$

(b) $\text{Exp}\left(t^2/2\right)$

(c) $\text{Exp}\left(\frac{\mu t + \sigma^2 t^2}{2}\right)$

(d) None of the above

41. Suppose that X and Y are independent random variables with variances $\sigma_x^2 = 2$ and $\sigma_y^2 = 3$. Then the variance of the random variable $Z = 3X - 2Y + 5$ is :

(a) 10

(b) 20

(c) 30

(d) 40

42. If we take $\alpha = 1$ in Gamma distribution with parameters α and β, we get :

(a) Chi-square distribution

(b) Weibul distribution

(c) F-distribution

(d) Exponential distribution

43. For which of the following distribution, mean and variance of the distribution are same ?

(a) Normal

(b) Binomial

(c) Geometric

(d) Poisson

44. A significant difference between the statistic and parametric value means :

(a) the difference is real

(b) the difference is due to sampling bais

(c) the difference is due to chance

(d) none of the above

45. The standard error decreases when sample size :

(a) increases

(b) decreases

(c) remains constant

(d) is small

46. The degrees of freedom for a 3 × 3 contingency table is :

(a) 9

(b) 6

(c) 4

(d) None of the above

47. Which of the following is a statistic if μ is unknown ?

(a) $Y = \Sigma (x_i - \mu)^2$

(b) $Y = \Sigma x_i$

(c) $Y = \Sigma(x_i - \mu)$

(d) $Y = \frac{\Sigma (x_i - \mu)^2}{n}$

48. 90% confidence limits for μ are :

(a) $\bar{x} \pm 2.58 \frac{\sigma}{\sqrt{n}}$

(b) $\bar{x} \pm 1.96 \frac{\sigma}{\sqrt{n}}$

(c) $\bar{x} \pm 1.645 \frac{\sigma}{n}$

(d) None of the above

49. If $x_1, x_2, \ldots, x_{20}$ are drawn from a non-normal population then in order to test $H_0 : \bar{x} = \mu_0$ *Vs.* $H_1 : \bar{x} \neq \mu_0$ (where μ_0 is a specified value) then we make use of which of the following test :

(a) *t*-test

(b) *z*-test

(c) sign test

(d) none of the above

50. In simple random sampling, the variance of the sample mean is given by :

(a) $\frac{s^2}{n} \cdot \frac{N}{n}$

(b) $\frac{s^2}{n} \cdot \left(\frac{N-n}{N}\right)$

(c) $\frac{\sigma^2}{n} \cdot \left(\frac{N-n}{N}\right)$

(d) None of the above

51. A 2^3-factorial experiment can be performed as a CRD with :

(a) 4 treatments

(b) 8 treatments

(c) 12 treatments

(d) None of the above

52. If a null hypothesis $H_0 : \tau_1 = \tau_2 = \tau_3$ is accepted while using a CRD at 0.05 level of significance, it means that :

(a) treatments are equally effective

(b) treatments are not effective

(c) treatments are equally effective at $\alpha = .05$

(d) none of the above

53. Relative efficiency of LSD over RBD when rows are taken as blocks is given by (taking m treatments and notations carry their usual meanings) :

(a) $\dfrac{\text{MSC} + (m-1)\,\text{MSE}}{m\,.\,\text{MSE}}$

(b) $\dfrac{\text{MSR} + (m-1)\,\text{MSE}}{(m-1)\,\text{MSE}}$

(c) $\dfrac{\text{MST} + (m-1)\,\text{MSE}}{(m-1)\,\text{MSE}}$

(d) None of the above

54. The correlation coefficient for the following data between X and Y :

X	:	1	2	3	4	5
Y	:	6	7	8	9	10

is given by :

(a) Zero

(b) +1

(c) –1

(d) None of the above

55. If b_{xy} = 1/6 and b_{yx} = 3/2, then the value of r is :

(a) 1

(b) 3/4

(c) +0.5

(d) –0.5

56. Standard deviation of a Binomial distribution $\text{B}\left(16, \frac{1}{2}\right)$ is given by :

(a) 2

(b) 4

(c) 16

(d) None of the above

57. If the two regression lines are coincident, then the relation between two regression coefficients is :

(a) $b_{yx} = b_{xy}$

(b) $b_{yx}b_{xy} = 1$

(c) $b_{yx} < b_{xy}$

(d) $b_{xy} = b_{yx}$

58. Factorization theorem for sufficiency is known as :

(a) Fisher Neyman Theorem

(b) Cramer-Rao Theorem

(c) Rao-Blackwell Theorem

(d) Chapman-Robin's Theorem

59. If Net Reproduction Rate is greater than one then it will result into :

(a) no increase in population

(b) negative increase in population

(c) exponential increase in population

(d) increase in population

60. Moment Generating Function (mgf) of binomial distribution is given by :

(a) $\left(p + qe^t\right)^n$

(b) $\left(q + e^t\right)^n$

(c) $(p + q)^t$

(d) $\left(q + pe^t\right)^n$