Q-AD-E-S-2017

SERIES : D 44

SERIAL NO:

Time Allowed: Two Hours **Maximum Marks: 100**

I N S T R U C T I O N S

DO NOT OPEN THIS QUESTION BOOKLET SEAL UNTIL YOU ARE TOLD TO DO SO

1. Immediately after the commencement of the examination, you should check that this Test Booklet does not have any unprinted or torn or missing pages or items, etc. If so, get it replaced by a complete Test Booklet.
2. Write your Roll Number on the Test Booklet in the Box provided alongside.
3. This Test Booklet contains 200 items (questions) and you are expected to answer only 100 questions. Answers recorded after the first 100 in ascending numerical order will be treated as non-existent. Each item comprises four responses (answers) written as **(a), (b), (c) and (d)**. You will select the response which you feel is correct and want to mark on the answer sheet.
4. You have to mark all your responses ONLY on the separate Answer Sheet provided. Also read the directions in the Answer Sheet. Fill in all the entries in the Answer Sheet correctly, failing which your Answer Sheet shall not be evaluated.
5. Count the number of questions attempted carefully and write it down in the space provided in the OMR Sheet. This has to be verified by the Invigilator before leaving.
6. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded you should hand over to the Invigilator the Answer Sheet (in original). **You are permitted to take away 2nd Copy of OMR Answer Sheet and the Test Booklet.**
7. All items carry equal marks.
8. Candidature would be cancelled in case of non-compliance with any of these instructions.
9. **Penalty for wrong answers:**
   THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE AS BELOW.
   (i) For each question answered incorrectly, **0.5 marks will be deducted** as penalty.
   (ii) If a candidate selects more than one answer out of the four probable answers to a question, it will be treated as a **wrong answer** even if one of the given answer happens to be correct and 0.5 marks deducted.
   (iii) No negative marks will be allotted if a question is left blank, i.e. there will be no penalty for that question.

"Mobile phones, calculators, IT gadgets, smart watch and any other electronic device such as Bluetooth, etc. are not allowed inside the premises where the examination is being conducted. Any infringements of these instructions shall entail disciplinary action including ban from future examinations."

Question Starts

1. If two goods are perfect complements, which of the following holds:
   (A) MRS is one and indifference curves are right angled
   (B) MRS is one and indifference curves are convex to the origin
   (C) MRS is infinity and the indifference curves are right angled
   (D) MRS is infinity and the indifference curves are convex to the origin

2. For a production function of the shape $q = AL^{a}K^{1-a}$, where q = output, L = Labour, K = capital, the long-run expansion path is:
   (A) Straight line from the origin
   (B) Upward sloping concave line
   (C) Upward sloping convex line
   (D) Downward sloping straight line

3. Which of the following statements is correct:
   (A) Laspeyres index understates inflation while Paasche index overstates it
   (B) Paasche index understates inflation while Laspeyres index understates it
   (C) Both Laspeyres and Paasche index overstate inflation
   (D) Both Laspeyres and Paasche index understate inflation

4. For a bridge operator, if the demand for crossing certain bridge Q is given by demand function P = 30 – Q, while Marginal cost of operating the bridge is zero and there is no toll, then how many people will cross the bridge?
   (A) 10 (B) 20
   (C) 15 (D) 25

5. Which of the following violates long run competitive equilibrium condition:
   (A) All firms in the industry are maximizing profits
   (B) No firm has an incentive to enter and exit
   (C) Firms earn positive profit
   (D) Quantity supplied is equal to quantity demanded in the industry

6. Which of the following is the Lerner's Index of Monopoly Power (L):
   (A) L = (MC – P)/P
   (B) L = (P – MC)/P
   (C) L = (P – MC)/MC
   (D) L = (MC – P)/MC

7. In a duopoly model, Market demand curve is given by P = 30 – Q, where $Q = Q_1+Q_2$, and Marginal cost of production for each firm = 0. The equilibrium output under Cournot model is given by:
   (A) $Q_1 = 20, Q_2 = 10$
   (B) $Q_1 = 20, Q_2 = 20$
   (C) $Q_1 = 10, Q_2 = 20$
   (D) $Q_1 = 10, Q_2 = 10$

8. In IS-LM model, Government expenditure multiplier is :
   (A) Smaller than simple Keynesian model
   (B) Equal to simple Keynesianmodel
   (C) Longer than simple Keynesianmodel
   (D) Always infinite

9. Suppose the following equations are given for IS-LM curves –
   IS curve: Y = 350 – 1000r
   LM curve: Y = 200 + 500r
   Where Y= income and r = real rate of interest
   What will be the equilibrium values of Y and r?
   (A) Y = 200, r = 0.04
   (B) Y = 250, r = 0.1
   (C) Y = 300, r = 0.15
   (D) Y = 350, r = 0.2

10. In IS-LM model, government expenditure multiplier does not depend on:
    (A) Slope of savings function
    (B) Slope of investment function
    (C) Slope of speculative demand function
    (D) Slope of autonomous consumption

11. In Kaldor's growth model, the warranted growth and actual growth becomes equal to each other through:

(A) Change in capital-output ratio
(B) Change in population growth rate
(C) Change in savings ratio
(D) Change in profit share in income distribution

12. Samuelson-Hicks type of trade cycle models will show stability and cyclical fluctuations only if:

(A) The income expansion path shows complex roots whose magnitudes are less than one
(B) The income expansion path shows real roots whose magnitudes are less than one
(C) The income expansion path shows real roots whose magnitudes are more than one
(D) The income expansion path shows complex roots whose magnitudes are more than one

13. Friedman's restatement of quantity theory of money demand basically shows which one of the following statements:

(A) Income velocity becomes a function of rate of interest and inflation
(B) Income velocity becomes a function of money supply
(C) Money demand always becomes an inelastic function
(D) Money demand becomes independent of rate of return

14. In Tobin's portfolio balance approach to demand for money, the indifference curves of plungers are necessarily:

(A) Negatively sloped and concave
(B) Positively sloped and convex
(C) Positively sloped and concave
(D) Negatively sloped and convex

15. Suppose the economy is in equilibrium and also in liquidity trap. Government increases its exogeneous investment by Rs. 1,000. If the marginal propensity to consume is 0.8, equilibrium income would increase by :

(A) 1000
(B) 5000
(C) 800
(D) 200

16. The term "missing women" has been coined by

(A) Hans Singer
(B) Harvey Leibenstein
(C) MahbubUl-Haq
(D) AmartyaSen

17. In a two-country two-good model, country A is labour abundant and country B is capital abundant. Good X is capital-intensive and good Y is labour-intensive. Which of the following is correct?

(A) A imports X and exports Y
(B) A exports X and imports Y
(C) B imports X and exports Y
(D) A exports both X and Y

18. Intra-industry trade is defined as:

(A) Trade between two industries ina country
(B) Trade within an industry in a country
(C) Trade between two industries intwo different countries
(D) Trade between two countries of goods in the same industry

19. The 'inclusive growth strategy' emphasises on attainment of

(A)higher economic growth alone
(B)higher economic growth and reduction of poverty
(C)higher economic growth and creation and equalisation of opportunities among the people
(D) higher job creation

20. Poverty in India is measured in terms of
(A) Calorie intake
(B) Educational level
(C) Wealth level
(D) Both (a) and (c)

21. An effective exchange rate is a:

(A) Price adjusted exchange rate
(B) Spot exchange rate effective in the market
(C) Exchange rate against aweighted basket of currencies
(D) Exchange rate quoted against the most important currency ofthe world

22. As per the Sample Registration System report for 2013, the infant mortality rate is highest in

(A) Assam and West Bengal
(B) Bihar and Uttar Pradesh
(C) Madhya Pradesh and Assam
(D) Jharkhand and Chhattisgarh

23. According to the Planning Commission estimate (using Tendulkar methodology), the rural poverty ratio (%) in India in 2011-12 was

(A) 50.1
(B) 37.2
(C) 25.7
(D) 21.9

24. Which of the following best represent a public good:
(A) Each individual is a price taker and a quantity adjuster
(B) Each individual is both a quantity and a price taker
(C) Each individual is a quantity taker and a price adjuster
(D) Each individual is both a quantity and a price adjuster

25. If investment function becomes unresponsive to interest rate, then:

(A) Fiscal policy becomes ineffective
(B) Fiscal policy becomes effective
(C) Monetary policy becomes effective
(D) Both fiscal and monetary policy are effective

26. If an equilibrium growth rate of 10 percent is to be achieved for GDP and the capital-output ratio is 4, then the savings rate should be (from Solow model):

(A) 30 per cent
(B) 20 per cent
(C) 35 per cent
(D) 40 per cent

27. Select the correct match for the following by using codes given below :

(a) Capital inflow	(i) Franco Modigliani
(b) Human capital and growth	(ii) Robert Mundell
(c) Upper turning point	(iii) Robert Lucas
(d) Life-cycle theory	(iv) John Hicks

Codes :
(a) (b) (c) (d)
(A) (iv) (iii) (ii) (i)
(B) (iii) (ii) (i) (iv)
(C) (ii) (iii) (iv) (i)
(D) (i) (iii) (ii) (iv)

28. Select the correct match from the following by using codes given below :

a. Real Balance Effect	i. A.W.Phillips
b. Neo-classical growth model	ii.A.C. Pigou
c. Inflation- unemployment trade-off	iii. R. Solow
d. Knife-edge instability	iv. R. Harrod

(A) (a, i), (b, ii), (c, iii), (d, iv)
(B) (a, ii), (b, iii), (c, i), (d, iv)
(C) (a, iv), (b, iii), (c, ii), (d, i)
(D) (a, iii), (b, i), (c, iv), (d, ii)

29. The following statements are given:
A : According to Adam Smith International Trade takes place on the basis of comparative advantage.
B : The principle of absolute advantage is at the focal point of David Ricardo's theory of International Trade.

Make the correct choice :
(A) Statement (A) is incorrect and Statement (B) is correct
(B) Statement (A) is correct and Statement (B) is incorrect
(C) Both the statements (A) and (B) are correct
(D) Both the statements (A) and (B)are incorrect

30. A curve showing the quantity of its imported commodity that the nation demands in exchange of the supply of various quantities of export is called:

(A) Lorenz curve
(B) Offer curve
(C) Production Possibility Curve
(D) Laffer curve

31. Match the following:

a. Liquidity Trap	i. Edmund Phelps
b. Adaptive Expectation	ii. Alfred Pigou
c. Wealth Effect	iii. John Maynard Keynes
d. Restated Quantity Theory	iv. Milton Friedman

(A) (a,i), (b,ii), (c,iii), (d,iv)
(B) (a,iii), (b,iv), (c,i), (d,ii)
(C) (a,iv), (b,iii), (c,ii), (d,i)
(D) (a,iii), (b,i), (c,ii), (d,iv)

32. In permanent income hypothesis, transitional income has :

(A) Positive and high correlation with permanent income
(B) Zero correlation with permanent income
(C) Positive and low correlation with permanent income
(D) Negative correlation with permanent income

33. Fiscal federalism must contain the following:

(A) Determination of taxes only for the central government
(B) Determination of taxes only for the state government
(C) Sharing of revenue between state and central governments
(D) Sharing of revenue among different states

34. Tax buoyancy refers to:

(A) Percentage change in tax revenue due to change in tax rate
(B) Percentage change in tax revenue due to change in tax base
(C) Percentage change in tax base due to change in tax rate
(D) Percentage change in tax rate due to change in investment

35. The main reason for an increase in the share of states in tax revenue by the fourteenth finance commission is:

(A) States are incapable of raising taxes
(B) Centre is earning too much revenue
(C) States will have more freedom in choosing their own projects
(D) Overall deficit finance in the economy will be reduced

36. The Chairman of the 14th Finance Commission is
(A) Y.V. Reddy
(B) Vijay Kelkar
(C) A.M. Khusro
(D) C. Rangarajan

37. One limitation of absorption approach to Balance of Payment adjustment is:

(A) It assumes a constant income
(B) It assumes a constant Terms of Trade
(C) It assumes a constant aggregate expenditure
(D) It assumes nominal devaluation of currency

38. Which of the following agreements is not under WTO rules:
(A) Agreement on Agriculture
(B) Agreement on Rules of Origin
(C) Agreement on Trade Related Intellectual Property Rights
(D) Agreement on Trade related outsourcing

39. An Accommodating capital inflow for a country implies:
(A) Balance of Payments is in surplus
(B) Balance of Payments is in deficit
(C) Balance of Payment is zero
(D) Balance of Payment is already in equilibrium

40. Under no foreign repercussions, change in income for a country having savings propensity= 0.4 and import propensity= 0.2, change in autonomous investment= 600 is given by the value:

(A) 6000
(B) 4000
(C) 2000
(D) 1000

41. One reason for Leontief Paradox to appear for empirical verification of Heckscher-Ohlin theory of international trade is:

(A) US exports were technically inferior
(B) US exports were skilled labour intensive
(C) US exports were scale intensive
(D) US exports had unfavourable terms of trade

42. The indirect utility function of a consumer can be obtained by
(A) maximising the direct utility function of the consumer subject to the budget constraint
(B) minimising the expenditure of the consumer subject to a specific utility level
(C) from the compensated demand function of the consumer keeping the budget constraint
(D) using the Weak Axiom of Revealed Preference

43. An increase in the price of a commodity when demand is inelastic causes the total expenditures of consumers of the commodity to

(A) increase
(B) decrease
(C) remain unchanged
(D) be indeterminate

44. Arrangement of the numerical data in ascending or descending order is:

(A) An array
(B) Tabulation of data
(C) Frequency distribution of data
(D) Raw data

45. Which of the following measures of dispersion is based on all the data observations:

(A) Range
(B) Inter-quartile range
(C) 10-90 percentile range
(D) Standard deviation

46. Three officers of the same rank are recruited in an organization. Determine the number of ways in which three different offices can be assigned to these three officers:

(A) 3
(B) 6
(C) 9
(D) 27

47. Who among the following scholars is credited for coining the term econometrics?

(A) Carl Friedrich Gauss
(B) Francis Galton
(C) Trygve Haavelmo
(D) Ragner Frisch

48. In method of least squares, the principle is to minimize:

(A) Sum of errors
(B) Product of errors
(C) Squares of errors
(D) Sum of squares of errors

49. Choose the appropriate statement to complete the following sentence.
Central Limit Theorem refers to:

(A) (A)the tendency of the sample means to be different from the population means.
(B) the tendency of the mean of population means to equal the sample mean
(C) (C)the tendency of the mean of sample means to equal the population mean.
(D) the tendency for all sample means to be equal

50. Which is a non-probability based sampling method?

(A) Systematic Sampling
(B) Stratified Random Sampling
(C) Purposive sampling
(D) Simple Random Sampling

51. Identification of multicollinear variables in the multiple regression model may be performed using

(A) The VIF test
(B) The Durbin-Watson test
(C) The White test
(D) Park test

52. Which of the following satisfy time reversal test but not factor reversal test?

(A) Laspeyre's Index No.
(B) Fisher's Index No.
(C) Paasche's Index No.
(D) Marshall-Edgeworth Index No.

53. The consistency, unbiasedness and efficiency of the OLS estimator need the assumptions
1) $E(u_t) = 0$, 2) $Var(u_t) = \sigma^2$, 3) $Cov(u_t, u_{t-j}) = 0 \ \forall j$ and 4) $u_t \sim N(0, \sigma)$

(A) 2 and 4 only,
(B) 1 and 3 only,
(C) 1, 2 and 3 only,
(D) 1, 2, 3, and 4;

54. A sure way of removing multicollinearity from the model is to

(A) Work with panel data
(B) Drop variables that cause multicollinearity in the first place
(C) Transform the variables by first differencing them
(D) Take only standardized variables

55. If a Durbin Watson statistic takes a value close to 4, what will be the value of the first order autocorrelation coefficient?

(A) Close to zero;
(B) Close to -1;
(C) Close to +1;
(D) Close to either +1 or, -1;

56. Which of the following measures of the central tendency suits the data best if the objective is to assess the distribution of values?

(A) Arithmetic mean
(B) Mode
(C) Median
(D) Kurtosis

57. The standard error of regression is

(A) An estimate of standard deviation of the regression error term.
(B) Standard deviation of the estimated intercept.
(C) Standard deviation of the estimated slope coefficient.
(D) An estimate of standard deviation of the dependent variable of the model

58. The estimated regression models having different number of explanatory variables are compared on the basis of

(A) r^2- statistic
(B) R^2 - statistic
(C) AdjsutedR^2 -statistic
(D) χ^2- statistic

59. The model selection criterion that imposes larger penalty for inclusion of additional explanatory variable in the model is

(A) Akaike Information Criterion
(B) Schwartz Bayesian Criterion
(C) Hannan-Quin Criterion
(D) Adjusted R^2 Criterion

60. For $R^2 = 0.60$, k (no. of regressors) = 2 and n (sample size) = 10, then Adjusted R^2 is

(A) 0.56
(B) 0.55
(C) 0.54
(D) 0.53

61. Heteroskedasticity problem may be controlled by

(A) Log-transformation of data
(B) Using a suitable deflator
(C) Both (a) and (b)
(D) Cannot be controlled at all

62. Estimation using OLS on autocorrelated data results in the parameters being estimated to be

(A) Biased
(B) Inconsistent
(C) Asymptotically normally distributed
(D) Inefficient

63. The 'dummy variable trap' arises when
(A) Many irrelevant explanatory variables are mistakenly included along with dummy variables in the model.
(B) The number of dummies included is equal to the number of sub-sample categories.
(C) The number of dummies included is less than the number of sub-sample categories.
(D) The number of dummies is equal to the number of other quantitative explanatory variables.

64. The term cointegration has been coined by

(A) F. M. Fisher
(B) R. Frisch
(C) C. W. J. Granger
(D) Christopher A Sims

65. The ARIMA forecasting method is developed by

(A) Engle and Granger
(B) Dickey and Fuller
(C) Box and Jenkins
(D) Sims and Sargent

66. The simultaneous equations bias
(A) refers to the bias of the researcher towards using his chosen model
(B) refers to the bias in the estimated parameters that disappears when sample size becomes large
(C) refers to the bias in the estimated parameters that does not disappear when sample size becomes large
(D) means the error terms are biased positively in small samples

67. An appropriate method to estimate an over-identified equation is
(A) OLS
(B) ILS
(C) 2SLS
(D) Ridge regression

68. Which of the following is a not a method to smooth out random fluctuations in a stable time series

(A) Weighted Moving Average
(B) Moving Average
(C) Exponential Smoothing
(D) Method of Least Squares

69. In case you are interested to select a subset of individuals from a bigger group under some constraints the type of linear programming for that purpose shall be called...

(A) Integer programming
(B) Binary Integer Programming
(C) Decision Programming
(D) Team Optimization

70. The hazard function is also called as

(A) Failure rate
(B) Survival function
(C) Conditional Failure Rate
(D) Right censoring

71. A method used to graph and estimate survival curve is
(A) log-rank test
(B) Reliability function
(C) Kaplan-Meier Method
(D) Median Survival time

72. The Boole's inequality is given by P(A ∩ B) ≥

(A) P(A) × P(B)
(B) P(A′) + P(B′)
(C) 1- P(AUB)
(D) 1-P(A′)-P(B′)

73. If X is a random variable defined on (Ω, S) and a and b are constants then $aX + b$ is
(A) is a random variable from $(\Omega, aS+b)$
(B) is a random variable from (Ω, S)

(C) is a random variable from $(a\Omega+b, S)$
(D) Is a linear function and not a random variable

74. If two random variables X and Y are independent the Cov(X, Y) =

(A) 0
(B) E(X) E(Y)
(C) infinity
(D) correlation of (X, Y)

75. In case of a hyper geometric distribution defined by $P(X=x)=\frac{\binom{M}{x}\binom{N-M}{n-x}}{\binom{N}{n}}$ then the range of x is
(A) 0,1,2,...
(B) 0,1,2,..., n
(C) ≥ min (M, n)
(D) ≤ min (M, n)

76. For the gamma distribution defined as $f(x)=\frac{1}{\Gamma(\alpha)\beta^{\alpha}}y^{\alpha-1}e^{-y/\beta}$ the moment generating function is given by

(A) $(1-\beta t)$
(B) $(1-\beta t)^{\alpha}$
(C) $(1-\beta t)^{-\alpha}$
(D) $(1-\alpha t)^{-\beta}$

77. If X and Y are two independent random χ^2 variates with m and n degrees of freedom respectively, then $\frac{X/m}{Y/n}$ follows-

(A) t-distribution
(B) F-distribution
(C) χ^2-distribution
(D) Gamma distribution

78. If an estimator T_n of a parameter θ converges in probability to θ as n tends to infinity then it is said to be

(A) Sufficient
(B) Efficient
(C) Consistent
(D) Unbiased

79. The Cramer-Rao inequality with regard to the variance of an estimator provides:

(A) upper bound of variance
(B) lower bound of variance
(C) Asymptotic variance
(D) Value of the population variance

80. The sample median as the estimator of the population mean is always

(A) Unbiased
(B) Efficient
(C) Consistent
(D) None of the above

81. A family receives 1, 2 and 3 wrong telephone calls on three randomly selected days. Assuming that the wrong calls follow Poisson Distribution, estimate the number of wrong calls in 6 days.

(a) 6 (b) 12
(c) 24 (d) 36

82. If there are three attributes A, B and C the number of first order classes are

(a) 6 (b) 9
(c) 12 (d) 18

83. A finite difference table is said to be a central difference table if:

(A) The origin x_o is the first argument in a series
(B) The origin x_o is the last argument in a series
(C) The origin x_o is the intermediary value of the series
(D) none of the above

84. Harmonic analysis method is based on the function of y_t expressed in the form of:

(A) Taylor's Function
(B) Harmonic Series
(C) Fourier Series
(D) Exponential series

85. Consumer price index number is constructed for
(A) A well defined section of the people
(B) All People
(C) Factory Workers only
(D) Farmers

86. The relation between the expected value of *R* and SD σ with usual constant factors is:

(A) $E(R) = d_1 \sigma$
(B) $E(R) = d_2 \sigma$
(C) $E(R) = D_1 \sigma$
(D) $E(R) = D_2 \sigma$

87. The graph of the proportion of defectives in a lot against sample numbers is called:

(A) OC Curve
(B) ASN Curve
(C) Power Curve
(D) Lot defective curve

88. An urn contains m distinguishable ball marked from 1 to m. We draw n balls from the m balls one after another but with replacement after each drawing but before the next drawing is made. The total number of possible samples are:
(a) ${}^nC_m$ (b) n^m
(c) m^n (d) n×m

89. The coefficients in the expansion of $(a+b)^5$ are

(A) 1,5,10,12,10,5,1
(B) 1,5,12,12,5,1
(C) 1,6,12,12,6,1
(D) 1,5,10,10,5,1

90. Suppose you toss a perfect coin repeatedly until a head turns up. If X denotes the number of tosses it takes until the first head appears then P(X = n) is

(a) $1/2^n$ (b) $1/2^{n-1}$
(c) p^n (d) $(1-p)^n$

91. If X is a continuous random variable with $E(X) = \mu$ then $P(X = \mu)$ is

(A) ½
(B) 0
(C) *greater than* ½
(D) depends on V(X)

92. If X and Y are two independent random variables than E(|XY|) is

(A) = E(|X|) E(|Y|)
(B) ≤ E(|X|) E(|Y|)
(C) ≥ E(|X|) E(|Y|)
(D) depends on V(XY)

93. In the analysis of variance table for a two way classified data with *p* rows and *q* columns with *m* observations per cell the error df is given by-

(A) (p-1)(q-1)(m-1)
(B) pqm-1
(C) (p-1)(q-1)m
(D) pq(m-1)

94. When the experimental units are homogeneous the design that shall be applied is
(A) RBD
(B) LSD
(C) Fraction Factorial
(D) CRD

95. In a m×m Latin Square design the error df is given by

(a) $(m-1)^2$ (b) $(m-1)^3$
(c) (m-1)(m-2) (d) m^2-1

96. In a 2^3 factorial experiment the following two blocks, Block 1 and

(1) pk nk np	n p k npk

the effect that is confounded is

(a) np (b) npk
(c) nk (d) pk

97. The Split plot design is used if the factor has to be applied in

(A) Small experimental unit
(B) Large experimental unit
(C) Independent of the size of the experimental unit
(D) Experimental units that are uniform

98. Let X represent the missing value in a RBD experiment with r replicates and t treatments and let B' and T' be the total of the block and treatment where the missing observation occurred. Then the estimate of x is given by,

(A) $\frac{tB'+rT'-G'}{(r-1)(t-1)}$

(B) $\frac{rB'+tT'-G'}{(r-1)(t-1)}$

(C) $\frac{B'+T'-G'}{(r-1)(t-1)}$

(D) $\frac{rB'+tT'-G'}{(rt-1)}$

99. A Sampling frame is a

(A) List of all units selected in the sample
(B) Process of sampling
(C) list of all units in the population
(D) Telephone number of the sampled members

100. Which of the following is not a random number table

(A) Tippett's series
(B) Fisher and Yates' series
(C) Pearson's series
(D) Kendall and Smith's Series

101. Systematic sampling is a

(A) Non-probability Sampling
(B) Probability Sampling
(C) Judgment Sampling
(D) Mixed sampling

102. The method of monthly averages is a process used in time series to measure

(A) Seasonal fluctuation
(B) Separating irregular fluctuation from long time trend
(C) Cyclical Fluctuation
(D) Long time trend

103. Relative change in the expenditure in a given item to the relative change in total expenditure is called as

(A) Income-demand elasticity
(B) Elasticity of demand with respect to total expenditure
(C) Price elasticity
(D) Expenditure elasticity

104. Which of the following is a limitation of the statistical definition of probability

(A) It cannot be applied when the total number of cases are large
(B) It is restricted to independent cases only
(C) The additive law of probability cannot be deduced
(D) It only provides the limiting value of a probability

105. Six cards are drawn randomly from a well shuffled pack of 52 cards with replacement. What is the probability that all the four suits shall be represented at least once in those 6 cards?

(A) 0.3 (B) 0.4
(C) 0.6 (D) 0.8

106. The mean time to failure (MTTF) when the failure rate $\lambda(t) = \lambda$ is given by

(A) λ (B) λt
(C) $1/\lambda t$ (D) $1/\lambda$

107. If O is a null matrix then |A| shall be

(A) Always equal to 0
(B) Sometimes > 0
(C) equal to 0 only if |A| is computable
(D) sometimes undefined

108. If A and B are two skew symmetric matrices of order $n \times n$ then AB shall be
(A) Always skew symmetric
(B) skew symmetric if AB = -BA
(C) skew symmetric if AB = BA
(D) skew symmetric if A+B is skew symmetric

109. The inverse of a $n \times n$ matrix A

(A) Always exists
(B) Always exists and is unique
(C) Sometimes exists and not necessarily unique
(D) exists if $|A| \neq 0$ and is unique

110. If X_1 follows binomial distribution with parameters (n_1, p_1) and X_2 follows binomial distribution with parameters (n_2, p_2). Then the distribution of $X_1 + X_2$ is,

(A) binomial with parameters (n_1+n_2, p_1)
(B) binomial with parameters (n_1, p_1+p_2)
(C) binomial with parameters (n_1+n_2, p_1+p_2)
(D) None of the above

111. The third central moment of the Poisson distribution with parameter m is given by,
(A) $m^2 + m$ (B) $m^2 - m$
(C) m (D) $m^3 + m^2 + m$

112. The recurrence relation of a geometric distribution with parameter p or q = 1-p is,

(A) P(X=x+1) = q P(X=x)
(B) P(X=x+1) = (q/p) P(X=x)
(C) P(X=x+1) = (p/q) P(X=x)
(D) P(X=x+1) = (1-p/q) P(X=x)

113. If for an event the probability of success changes from event to event and if the outcome of successive trials are dependent, then which probability distribution shall you recommend

(A) Poisson distribution
(B) Hyper Geometric distribution
(C) Binomial distribution
(D) Negative binomial distribution

114. For beta distribution of second kind with parameter a and b the mean is given by,

(A) $\frac{a}{b}$ (B) $\frac{a}{b-1}$
(C) $\frac{ab}{b-1}$ (D) $\frac{a(b-1)}{b}$

115. If $X_1, X_2, \ldots, X_n$ is a random sample of size *n* drawn from a population with CDF *F(.)* and PDF *f(.)* then the density function of the first order statistics is given by,

(A) $n[1-F(x)]^{n-1} f(x)$
(B) $n[F(x)]^{n-1} f(x)$
(C) $n[1-F(x)]f(x)$
(D) $\frac{[1-F(x)]^{n-1}}{f(x)}$

116. If both the samples are sufficiently large then the significant test for the difference between two standard deviations shall be tested using –

(A) Z test (B) F test
(C) t-test (D) Chi-square test

117. The coefficient of concordance is a measure of –

(A) Quadratic relationship between two variables
(B) Agreement between two variables
(C) Exponential relation between two variables
(D) Independence between variables

118. If X(t) is a stochastic process then the possible values of the process is called as–
(A) the state space
(B) the parameter space
(C) a random process
(D) sample space

119. If X(t) and X(t+h) has the same probability density then the stochastic process is said to have –

(A) Stationary
(B) invariant under translation of time
(C) evolutionary process
(D) Poisson Process

120. The diagram used for representing the transition probability matrix is called

(A) Digraph
(B) Venn diagram
(C) TPM locator
(D) Diagraph

121. In a persistent Markov chain the probability that starting with state i the system will return to the same state i is

(A) 0 (B) > 0
(C) 1 (D) ½

122. Which of the following is not an example of Random Walk

(A) Population Growth
(B) Limiting form of Wiener Process
(C) Gambler's Ruin Problem
(D) Brownian Motion

123. Patients arrive randomly and independently at a doctors consulting room from 8 AM at an average rate of one in 5 minutes. The waiting room can hold 12 persons. What is the probability that the room will be full when the doctor arrives at 9 AM? [Given exp(-1.2) = 0.301]

(A) 0.6 (B) 0.8
(C) 0.41 (D) 0.5

124. The theorem in probability that deals with sum of large number of independent random variables is called

(A) Strong law of large numbers
(B) Central limit theorem
(C) Weak law of large numbers
(D) Convergence in probability

125. If X is a random variable with E(X) = 3 and $E(X^2) = 13$, then determine a lower bound for the probability P[-2<X<8]

(A) 4/5 (b) 1/6
(c) 21/25 (d) 13/25

126. If X is a random variable dependent on Y then, Var(X) =

(A) E[Var(X|Y)]+Var[E(Y|X)]
(B) E[Var(X|Y)]
(C) Var[E(Y|X)]
(D) E[Var(X|Y)]-Var[E(Y|X)]

127. An urn contains *a* white and *b* black balls, c balls are drawn at random without replacement. Find the mathematical expectation of the number of white balls drawn.

(a) $\frac{2c}{a+b}+1$ (b) $\frac{2ac}{a+b}$
(c) $\frac{2a}{b}$ (d) $\frac{ac}{a+b}$

128. Which statement below about maximum likelihood estimator of a parameter is incorrect

(A) Is not unique
(B) Not always unbiased
(C) May not always exists
(D) it is not invariant

129. The Neyman Pearson Lemma provides us with the

(A) Maximum Likelihood estimator of a parameter
(B) Shortest length confidence interval
(C) Best critical region for testing a simple null hypothesis
(D) Best critical region for testing a simple null hypothesis against a simple alternative hypothesis

130. The Chi-square test is a

(A) Parametric test
(B) Non-parametric test
(C) Both Parametric and Non-parametric test
(D) Semi Parametric Test

131. The Kolmogorov Smirnov test is used to
(A) test the randomness in a data set
(B) test if the data comes from a specified distribution
(C) test the specified value of median of a dataset
(D) test the significant difference between medians of more than two populations

132. The Hotelling's T^2 test statistic for one sample follows

(A) Z distribution
(B) F distribution
(C) t distribution
(D) Multivariate Normal distribution

133. In Bayesian inference when the prior and the posterior are of the same distributional form then, the prior is called as

(A) Non-informative prior
(B) Improper prior
(C) Natural Conjugate Prior
(D) Minimal Information Prior

134. The Gamma mixture of a Poisson distribution is a

(A) Z distribution
(B) negative binomial distribution
(C) Beta distribution
(D) Gamma distribution

135. Let $U=\{1,2,3,4,5,6,7,8\}$ be a universal set and $A=\{1,2,3,4\}$ and $B=\{2,4,5,7\}$ be two subsets of U. Then $A^c \cup B^c$ is
(A) $\{1,3,5,6,8\}$
(B) $\{1,3,4,6,7,8\}$
(C) $\{1,3,5,6,7,8\}$
(D) $\{1,2,3,5,6,7,8\}$

136. A relation ρ on a set S is said to be equivalence on S if ρ is

(A) reflexive and transitive
(B) symmetric and transitive
(C) reflexive and symmetric
(D) reflexive, symmetric and transitive

137. If $a=\lim_{n\to\infty}\left(1+\frac{1}{2}+\frac{1}{3}+....+\frac{1}{n}\right)$ and $b=\lim_{n\to\infty}\frac{1}{n}\left(1+\frac{1}{2}+\frac{1}{3}+....+\frac{1}{n}\right)$, then
(A) $a=b=\infty$
(B) $a=\infty, b=0$
(C) $a=\infty, b=1$
(D) $a=b=0$

138. Let $f(m,n)$ be defined by

$$f(m,n)=\begin{cases} n+1, \ if \ m=0, \\ f(m-1,1), \ if \ m\neq 0, n=0, \\ f(m-1,f(m,n-1)), \ if \ m\neq 0, n\neq 0, \end{cases}$$

where m and n are non-negative integers. Then $f(1,1)$ is equal to
(A) 1 (B) 2
(C) 3 (D) 4

139. If the function $f(x)=a_0\cos|x|+a_1\sin|x|+a_2|x|^3$ is differentiable at $x=0$, then

(A) $a_1=0, a_2=0$

(B) $a_0=0, a_1=0$

(C) $a_1=0$

(D) a_0, a_1, a_2 can take any real values

140. The total number of subsets of a finite set A has 56 more elements than the total number of subsets of another finite set B. Then the number of elements in the set A is

(A) 5 (B) 6
(C) 7 (D) 8

141. Let X be a continuous random variable having finite mean m and variance σ^2. Then the least value of the probability of the event $(m-2\sigma \le X \le m+2\sigma)$ is

(A) 0.25 (B) 0.50
(C) 0.75 (D) 1

142. Let $f(x)=\sin x$ and $g(x)=\cos x$ for $x\in[a,b]$. Then by Cauchy's mean value theorem, there exists $c\in(a,b)$ such that

$$\frac{f'(c)}{g'(c)}=\frac{f(b)-f(a)}{g(b)-g(a)},$$

where c is

(A) A.M. of a and b
(B) G.M. of a and b
(C) H.M. of a and b
(D) $\frac{a^2+b^2}{2}$

143. If $\left(\frac{1-i}{1+i}\right)^{100}=a+ib$, then

(A) $a=2, b=-1$ (B) $a=1, b=0$
(C) $a=0, b=1$ (D) $a=-1, b=2$

144. The equation $x^2+(\lambda+\mu)xy+\lambda\mu y^2+x+\mu y=0$ represents two parallel straight lines if

(A) $\lambda+\mu=0$ (B) $\lambda=4\mu$
(C) $\lambda=\mu$ (D) $\lambda+4\mu=0$

145. The expansion of the function $f(z)=\frac{1}{(z-1)(z-2)}$ in the region $|z|<1$ is given by

(A) $\frac{1}{2}+\frac{3}{4}z+\frac{7}{8}z^2+\frac{15}{16}z^3+....$

(B) $\frac{1}{2}-\frac{3}{4}z+\frac{7}{8}z^2-\frac{15}{16}z^3+....$

(C) $-\frac{1}{2}+\frac{3}{4}z-\frac{7}{8}z^2+\frac{15}{16}z^3-....$

(D) $-\left(\frac{1}{2}+\frac{3}{4}z+\frac{7}{8}z^2+\frac{15}{16}z^3+....\right)$

146. If $\cosh(u+iv)=x+iy$, then $\frac{x^2}{\cos^2 v}-\frac{y^2}{\sin^2 v}$ is equal to

(A) -1 (B) 0
(C) 1 (D) 2

147. The harmonic conjugate of the function $u(x,y)=y+e^x\cos y$ is

(A) $e^x\sin y-x$ (B) $e^x\sin y+x$
(C) $-e^x\sin y-x$ (D) $-e^x\sin y+x$

148. The number of optimal solution(s) of the LPP:

Maximize $Z = 6x_1+10x_2$

subject to $3x_1+5x_2\le 10,$

$5x_1+3x_2\le 15,$

$x_1, x_2 \ge 0,$

Is

(A) one (B) two
(C) at most finite (D) infinite

149. The sequence $\{(-1)^n n\}$ is

(A) bounded above
(B) bounded below
(C) bounded
(D) neither bounded above nor bounded below

150. If $f(z)=u(x,y)+iv(x,y)$ and $g(z)=u(x,y)-iv(x,y)$ are analytic functions defined on the same domain and $f(1+i)=2+3i$, then $g(4+3i)$ is

(A) $-4+3i$ (B) $4-3i$
(C) $-2+3i$ (D) $2-3i$

151. The integral $\int_{|z|=2} \frac{\cos z}{z^3} dz$ is equal to

(A) $2i\pi$ (B) $-2i\pi$
(C) $i\pi$ (D) $-i\pi$

152. If $u(x,y)=2x-x^2+ky^2$ is harmonic, then k should be

(A) 0 (B) 1
(C) 2 (D) 3

153. The solution of the integral equation $\sinh x=\int_0^x e^{x-t}y(t)dt$ is

(A) $y(x)=e^{-x}$
(B) $y(x)=e^{x}$
(C) $y(x)=\sinh x$
(D) $y(x)=\cosh x$

154. The mean of probability density function for a rectangular distribution

$$f(x)=\begin{cases}\frac{1}{b-a}, & a<x<b,\\ 0, & elsewhere,\end{cases}$$

is

(A) $\frac{a-b}{2}$ (B) $\frac{b-a}{2}$
(C) $\frac{a+b}{2}$ (D) ab

155. For any arbitrary function f, the general solution of the partial differential equation $y^2p-xyq=x(z-2y)$ can be put in the form

(A) $f(x^2+y^2, yz+y^2)=0$
(B) $f(x^2+y^2, yz-y^2)=0$
(C) $f(x^2-y^2, yz+y^2)=0$
(D) $f(x^2-y^2, yz-y^2)=0$

156. Solution of the partial differential equation $\frac{\partial^2 z}{\partial x^2}+z=0$, satisfying the conditions that when $x=0, z=e^y$ and $\frac{\partial z}{\partial x}=1$, is

(A) $z=\cos x+e^y \sin x$
(B) $z=\cos x-e^y \sin x$
(C) $z=\sin x-e^y \cos x$
(D) $z=\sin x+e^y \cos x$

157. The partial differential equation $yz_{xx}+(x+y)z_{xy}+xz_{yy}=0$ is

(A) hyperbolic everywhere
(B) elliptic everywhere
(C) hyperbolic everywhere except along the line $y=x$
(D) elliptic everywhere except along the line $y=x$

158. The resolvent kernel $R(x,t;3)$ for the kernel $K(x,t)=e^{x-t}$ is

(A) $e^{4(x-t)}$ (B) $e^{3(x-t)}$
(C) $e^{2(x-t)}$ (D) e^{x-t}

159. Which of the following transformation reduce the differential equation $\frac{dy}{dx}-\frac{\tan y}{1+x}=(1+x)e^x \sec y$, into the form $\frac{dv}{dx}+P(x)v=Q(x)$?

(A) $v=\cos y$ (B) $v=\sec y$
(C) $v=\tan y$ (D) $v=\sin y$

160. The shortest distance between the lines $x+4y-2z=5,\ x+2y+2z=13$ and $2x-2y+z=1,\ 2x+4y-z=9$ is

(A) 7 units (B) 5 units
(C) 6 units (D) 8 units

161. The integral equation $\int_0^x \frac{y(t)}{(x-t)^\alpha}dt=f(x);\ 0<\alpha<1$ is

(A) Fredholm integral equation of first kind
(B) Volterra integral equation of second kind
(C) Fredholm integral equation of second kind
(D) Abel's integral equation

162. The solution of the partial differential equation $u_{tt}-c^2u_{xx}=0$, $-\infty<x<\infty$, $t\geq 0$ satisfying the initial conditions $u(x,0)=f(x)$ and $u_t(x,0)=g(x)$ is

(A) $u(x,t)=\frac{1}{2}[f(x+ct)+f(x-ct)]+\frac{1}{c}\int_{x-ct}^{x+ct} g(\xi)d\xi$

(B) $u(x,t)=\frac{1}{2}[f(x+ct)+f(x-ct)]+\frac{1}{2c}\int_{x-ct}^{x+ct} g(\xi)d\xi$

(C) $u(x,t)=\frac{1}{2}[f(x+ct)+f(x-ct)]-\frac{1}{c}\int_{x-ct}^{x+ct} g(\xi)d\xi$

(D) $u(x,t)=\frac{1}{2}[f(x+ct)+f(x-ct)]-\frac{1}{2c}\int_{x-ct}^{x+ct} g(\xi)d\xi$

163. If $\phi_1(x)$ and $\phi_2(x)$ are any two solutions of $y''(x)+a(x)y'(x)+b(x)y(x)=c(x)$, where $a(x)$, $b(x)$ and $c(x)$ are continuous functions on $[0,\infty)$, then the solution of the corresponding homogeneous equation is

(A) $\phi_1(x)+\phi_2(x)$
(B) $\phi_1(x)-\phi_2(x)$
(C) $2\phi_1(x)+\phi_2(x)$
(D) $\phi_1(x)-2\phi_2(x)$

164. The value of λ for which the integral equation $y(x)=\lambda\int_0^1 e^{x-t}y(t)\,dt$ has a non trivial solution is

(A) -2 (B) -1
(C) 1 (D) 2

165. The equation $\tan\left(i\log\frac{x-iy}{x+iy}\right)=2$ represents a rectangular hyperbola given by

(A) $x^2-y^2=2xy$
(B) $y^2-x^2=2xy$
(C) $x^2-y^2=xy$
(D) $y^2-x^2=xy$

166. The value of the integral $\iint dxdy$ over the circular region $R: x^2+y^2\leq a^2$ is

(A) a^2 (B) πa^2
(C) $\frac{\pi a^2}{2}$ (D) $\frac{a^2}{4}$

167. The singular integral of the partial differential equation
$2xz - px^2 - 2qxy + pq = 0$
is
(A) $z^2 = xy^2$ (B) $z^2 = x^2y$
(C) $z = x^2y$ (D) $z = xy^2$

168. If A is an orthogonal matrix, then

(A) A^T and A^{-1} are both orthogonal
(B) A^T is orthogonal but A^{-1} is not orthogonal
(C) A^T is not orthogonal but A^{-1} is orthogonal
(D) A^T and A^{-1} both are not orthogonal

169. If Δ and ∇ are the forward and backward difference operators respectively and E be the shifting operator, then
(A) $\nabla = 1 + E^{-1}$ (B) $\Delta = 1 + E^{-1}$
(C) $\Delta = 1 - E^{-1}$ (D) $\nabla = 1 - E^{-1}$

170. In a group (G, *), a is an element of order 30. Then the order of a^{18} is
(A) 5 (B) 6
(C) 18 (D) 30

171. The total number of multiplications and divisions required to solve a system of n linear equations with n unknowns by Gaussian elimination method is
(A) $\frac{n\left(n^2+3n-1\right)}{6}$
(B) $\frac{n(n-1)(n+1)}{3}$
(C) $\frac{n(n+1)(2n+1)}{6}$
(D) $\frac{n\left(n^2+3n-3\right)}{6}$

172. The characteristic equation of a matrix A is $t^2 - t - 1 = 0$, then

(A) A^{-1} is $A + I$
(B) A^{-1} is $A - I$
(C) A^{-1} does not exist
(D) A^{-1} exist but cannot be determined from the given equation

173. Consider the following subspace of $\mathbb{R}^3$:
$W = \left\{(x, y, z) \in \mathbb{R}^3 : 2x + 2y + z = 0,\ 3x + 3y - 2z = 0,\ x + y - 3z = 0\right\}$
Then the dimension of W is

(A) 0 (B) 1
(C) 2 (D) 3

174. Simpson's $\frac{1}{3}$rd rule for the evaluation of $\int_a^b f(x)\,dx$ requires the interval $[a, b]$ to be divided into

(A) any number of subintervals
(B) an odd number of subintervals with equal width
(C) an even number of subintervals with unequal width
(D) an even number of subintervals with equal width

175. A subgroup H of a group G is said to be a normal subgroup of G if

(A) $aH = Ha$ for some $a \in G$
(B) $aH \neq Ha$ for some $a \in G$
(C) $aH = Ha$ for all $a \in G$
(D) $aH \neq Ha$ for all $a \in G$

176. If $f(x) = x^3 + 5x^2 + 5x + 1$ and α is a root of $f(x) = 0$, then

(A) $f(\alpha) = 0$ but $f\left(\frac{1}{\alpha}\right) \neq 0$
(B) $f(\alpha) = 0$ and $f\left(\frac{1}{\alpha}\right) = 0$
(C) $f(\alpha) \neq 0$ but $f\left(\frac{1}{\alpha}\right) = 0$
(D) $f(\alpha) \neq 0$ and $f\left(\frac{1}{\alpha}\right) \neq 0$

177. If A is an upper triangular matrix with all diagonal entries zero, then $I+A$ is

(A) invertible (B) idempotent
(C) singular (D) nilpotent

178. The iteration scheme $x_{n+1}=\frac{x_n}{2}\left(1+\frac{a}{x_n^2}\right)$ converges to $\sqrt{a}$. The convergence is

(A) linear (B) quadratic
(C) cubic (D) bi-quadratic

179. Let $S=\{1,-1,i,-i\}$. Then (S, .) is a cyclic group generated by

(A) 1, -1 (B) 1, i
(C) -1, i (D) i, -i

180. A root of the equation $x^3-x-1=0$ needs to be found by Newton-Raphson method. If the initial guess $x_0=2$, then x_1 is

(A) $\frac{5}{11}$ (B) $\frac{17}{11}$
(C) $\frac{5}{12}$ (D) $\frac{12}{17}$

181. Two dice are thrown. Then the probability that the sum of the faces equal to or exceeds 10 is

(A) $\frac{1}{3}$ (B) $\frac{1}{6}$
(C) $\frac{1}{18}$ (D) $\frac{1}{36}$

182. If X is a Poisson random variable with mean 2, then $P(|X-3|<1)$ is

(A) $\frac{3}{2}e^{-2}$ (B) $\frac{2}{3}e^{-2}$
(C) $\frac{3}{4}e^{-2}$ (D) $\frac{4}{3}e^{-2}$

183. If X be a random variable and $E(X^2)<\infty$, then for all $a>0$

(A) $P(|X|\geq a)\leq\frac{1}{a^2}E(X^2)$

(B) $P(|X|\leq a)\leq\frac{1}{a^2}E(X^2)$

(C) $P(|X|\geq a)\geq\frac{1}{a^2}E(X^2)$

(D) $P(|X|\leq a)\geq\frac{1}{a^2}E(X^2)$

184. Let $f(x,y)=\sum_{k=1}^{10}(x^2-y^2)^k$ for all $(x,y)\in\mathbb{R}^2$. Then for all $(x,y)\in\mathbb{R}^2$,

(A) $xf_x-yf_y=0$
(B) $xf_x+yf_y=0$
(C) $yf_x-xf_y=0$
(D) $yf_x+xf_y=0$

185. ~~Let $f:\mathbb{R}^2$~~ $\mathbb{R}$ be defined by

$$f(x,y)=\begin{cases}\frac{x^3}{x^2+y^4}, & \text{if } (x,y)\neq(0,0)\\ 0, & \text{if } (x,y)=(0,0).\end{cases}$$

Then,

(A) $f_x(0,0)=0$ and $f_y(0,0)=0$
(B) $f_x(0,0)=1$ and $f_y(0,0)=0$
(C) $f_x(0,0)=0$ and $f_y(0,0)=1$
(D) $f_x(0,0)=1$ and $f_y(0,0)=1$

186. If X and Y are independent random variables, then

(A) $Cov(X,Y)=0$
(B) $\mathrm{Cov}(X,Y)=-1$
(C) $Cov(X,Y)=1$
(D) $Cov(X,Y)=2$

187. $x^3 y\, z^3 \dfrac{\partial z}{\partial x} + xy^3 z^2 \dfrac{\partial z}{\partial y} = \sin(xy+z)$

is a first order

(A) linear Partial differential equation
(B) semi-linear Partial differential equation
(C) quasilinear Partial differential equation
(D) non- linear Partial differential equation

188. If a,b,c,d be positive and not all equal, then the least value of $(a+b+c+d)(bcd+cda+dab+abc)$ is

(A) 4 $abcd$ (B) 8 $abcd$
(C) 32 $abcd$ (D) 16 $abcd$

189. If $f(x)$ is continuous in $[a,b]$ and $F(x)$ be any function such that $F'(x) = f(x)$ for all $x \in [a,b]$, then

(A) $\int_a^b F(x)\,dx = f(b) - f(a)$

(B) $\int_a^b F(x)\,dx = f(a) - f(b)$

(C) $\int_a^b f(x)\,dx = F(a) - F(b)$

(D) $\int_a^b f(x)\,dx = F(b) - F(a)$

190. The equation

$x^2 + 4xy + 4y^2 + 3x + 4y - 2 = 0$

represents

(A) a hyperbola
(B) a parabola
(C) a pair of straight lines
(D) an ellipse

191. If two circles

$x^2 + y^2 + 2\lambda x + c = 0$ and

$x^2 + y^2 + 2\mu x + d = 0$

are orthogonal, then

(A) $\lambda = \mu$
(B) $\lambda = -\mu$
(C) $\lambda + \mu = c + d$
(D) $\lambda - \mu = c - d$

192. The vector given by

$\vec{A} = 3x^2 y\,\hat{i} + \left(x^3 - 2yz^2\right)\hat{j} + \left(3z^2 - 2y^2 z\right)\hat{k}$

is

(A) irrotational but not solenoidal
(B) solenoidal but not irrotational
(C) both irrotational and solenoidal
(D) neither irrotational nor solenoidal

193. Let $f(x) = |x| - [x]$ for $0 < x < 2$. Then the total jump of the function f at $x = 1$ is

(A) 1 (B) 0
(C) -1 (D) 2

194. If $a + \dfrac{b}{2} + \dfrac{c}{3} = 0$, where a, b, c are real constants, then the equation $a + bx + cx^2 = 0$ has

(A) at least one root between 0 and 1
(B) at least one root between 0 and 1 only when $b^2 - 4ac = 0$
(C) at least one root between 0 and 1 only when $b^2 - 4ac > 0$
(D) no real root

195. The probability mass function of a random variable X is given by

$P(X = x) = k\binom{n}{x}$, $x = 0, 1, \ldots\ldots n.$

If $P(X > 2) = P(X \le 2)$, then the value of k is

(A) $\dfrac{1}{4}$ (B) $\dfrac{1}{8}$
(C) $\dfrac{1}{16}$ (D) $\dfrac{1}{32}$

196. Let X be a discrete random variable such that $E(X) = E(X^2)$. Then the probability of the event $(X = E(X))$ is

(A) 0 (B) $\dfrac{1}{2}$
(C) 1 (D) $\dfrac{1}{3}$

197. Let G be a group and H be a non-empty subset of G. Then "H is a subgroup of G if and only if $a,\ b \in H$ implies that $ab \in H$" holds
(A) always
(B) never
(C) if H is finite
(D) if H is infinite

198. In an inner product space if $\|\alpha+\beta\| = \|\alpha\|+\|\beta\|$, then α and β are
(A) linearly dependent
(B) linearly independent
(C) null vectors
(D) none of these

199. If the foot of the perpendicular from the origin to a plane is (a,b,c), then the equation of the plane is
(A) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$
(B) $ax+by+cz=1$
(C) $ax+by+cz=0$
(D) $ax+by+cz=a^2+b^2+c^2$

200. There are two bags A and B. A contains n white and two black balls and B contains two white and n black balls. One of the two bags is selected at random and two balls are drawn from it without replacement. If the drawn balls are white and the probability that the bag A was used to draw the balls is $\frac{6}{7}$, then the value of n is
(A) 1 (B) 2
(C) 4 (D) 8

Question Ends