INVESTIGATOR DTE HOUSING (MAR 2026)

Booklet Serial No. 10977

DO NOT BREAK THE SEAL OF THE BOOKLET UNTIL YOU ARE TOLD TO DO SO

SERIES : I

QUESTION BOOKLET

Subjects : General English, General Knowledge and Economics/Statistics/Mathematics

Full Marks : 300 **Time Allowed : 2½ Hours**

Read the following instructions carefully before you begin to answer the questions.

INSTRUCTIONS TO CANDIDATES

1. This Booklet contains **150 questions** to be answered in a separate OMR Answer Sheet using Black Ballpoint Pen in the following three Parts :

Part—A	**General English**	:	**50 questions**
Part—B	**General Knowledge**	:	**25 questions**
Part—C	**[Choose any ONE subject from the following] Economics/Statistics/Mathematics**	:	**75 questions**

2. **All** questions are compulsory.
3. You will be supplied the Answer Sheet separately by the Invigilator. You must complete the details of particulars asked for.
4. Answer must be shown by completely blackening the corresponding circle in the Answer Sheet against the relevant question number by Black Ballpoint Pen. OMR Answer Sheet without marking Series shall not be evaluated.

   Example :
   Suppose the following question is asked :

   The Capital of Meghalaya is

   (A) Guwahati
   (B) Kohima
   (C) Shillong
   (D) Delhi

   You will have four alternatives in the Answer Sheet for your response corresponding to each question of the Question Booklet as below :

   Ⓐ Ⓑ Ⓒ Ⓓ

   In the above illustration, if your chosen response is alternative (C), i.e., Shillong, then the same should be marked on the Answer Sheet by blackening the relevant circle with a Black Ballpoint Pen only as below :

   Ⓐ Ⓑ ● Ⓓ

   The example shown above is the only correct method of answering.
5. Answer the questions as quickly and as carefully as you can. Some questions may be difficult and others easy. Do not spend too much time on any one question.
6. There will NOT be any negative marking for wrong answers.
7. The Answer Sheet must be handed over to the Invigilator before you leave the Examination Hall.
8. No Rough Work is to be done on the Answer Sheet. Space for Rough Work has been provided in the Question Booklet.

SEAL

PART—A : GENERAL ENGLISH

(*Marks* : 100)

Each question carries **2** marks

***Directions* (Q. Nos. 1–10) : Fill in the blanks with the appropriate preposition from the options given below.**

1. She has great influence _____ her younger sister.
(A) by
(B) in
(C) for
(D) over

2. People have been dying _____ a mysterious epidemic in the capital.
(A) in
(B) of
(C) by
(D) against

3. The puppy was trembling _____ fear.
(A) on
(B) in
(C) with
(D) for

4. Penny is swimming _____ the current.
(A) over
(B) above
(C) in
(D) against

5. She is Italian _____ marriage.
(A) with
(B) from
(C) by
(D) in

6. _____ what they say, it seems to be a nice place.
(A) With
(B) By
(C) From
(D) In

7. Translate this _____ English.
(A) into
(B) above
(C) for
(D) with

8. We congratulated her _____ her success.
(A) in
(B) by
(C) with
(D) on

9. The situation is now _____ control.
(A) on
(B) under
(C) into
(D) with

10. He has written letters _____ morning.
(A) from
(B) since
(C) till
(D) on

Directions **(Q. Nos. 11–15) : Choose the correct meaning for the words given below.**

11. 'Proficient' means

(A) skilled

(B) satisfactory

(C) mediocre

(D) ordinary

12. 'Overwhelmed' means

(A) fatigued

(B) affected

(C) overjoyed

(D) overcome

13. 'Chaotic' means

(A) positive

(B) traumatic

(C) uncontrolled

(D) problematic

14. 'Transparent' means

(A) transfer

(B) apparent

(C) surrender

(D) clear

15. 'Cajole' means

(A) gratitude

(B) coax

(C) jolly

(D) harass

Directions **(Q. Nos. 16–20) : Choose the correct substitute for the following.**

16. Preconceived judgement or opinion is

(A) uneducated

(B) judgemental

(C) conceit

(D) prejudice

17. A place of burial is a

(A) cyst

(B) cemetery

(C) totem

(D) cryo

18. One who knows several languages is a/an

(A) stylist

(B) essayist

(C) linguist

(D) artist

19. Being friendly and welcoming to guests and visitors is

(A) hospitable

(B) generous

(C) proficient

(D) animated

20. That which is no longer in use is

(A) opaque

(B) omniscient

(C) oblique

(D) obsolete

Directions **(Q. Nos. 21–25) : Read the following passage and answer the questions given below following the instructions.**

India is chiefly an agricultural land. The cultivation of crops depends on a proper **supply** of water throughout the year. Since olden times, large parts of our country have suffered from **occasional** periods of too much rain and those of drought. People had known that if **surplus** flood water could be stored away for use during the dry season, these problems will be solved. Unfortunately, they had neither the knowledge nor the means to do much in this direction. Whatever little they knew, they tried to put to practice. They dug canals to drain water from **perennial** rivers. This was heavy and expensive work and practicable over only a small area. Large tanks were **excavated** and small dams built to hold back floods. However, it was not possible to do anything on a countrywide scale.

Choose the appropriate synonyms of the following :

21. Supply
- (A) Source
- (B) Channel
- (C) Flow
- (D) Direction

22. Occasional
- (A) Mixed
- (B) Irregular
- (C) Alternate
- (D) Unseen

23. Surplus
- (A) Clean
- (B) Extreme
- (C) Excess
- (D) Free

24. Perennial
- (A) Lasting
- (B) Existing
- (C) Shifting
- (D) Drying

25. Excavated
- (A) Dug
- (B) Opened
- (C) Installed
- (D) Found

Directions **(Q. Nos. 26–30) : Choose the correct antonyms for the words given below.**

26. Improve
- (A) Disagree
- (B) Disprove
- (C) Deny
- (D) Deteriorate

27. Rare
- (A) Uncommon
- (B) Common
- (C) Real
- (D) Rest

28. Versatile
- (A) Various
- (B) Multiple
- (C) Inflexible
- (D) Talented

29. Extravagant
- (A) Arrogant
- (B) Pleasing
- (C) Honest
- (D) Economical

30. Amateur
- (A) Mature
- (B) Profound
- (C) Intelligent
- (D) Wicked

Directions **(Q. Nos. 31–35) : In these questions, out of four alternatives given, choose the one which best expresses the meaning of the underlined word.**

31. He is a competent piano player, though he does not play professionally.

(A) Confident
(B) Skilled
(C) Competitive
(D) Renowned

32. She demonstrated courage in the face of adversity.

(A) Enemies
(B) Security
(C) Hardship
(D) Opportunity

33. The artist showed genuine interest in our work.

(A) Sincere
(B) Incredible
(C) Half-hearted
(D) Weak

34. The changing of the seasons is an inevitable aspect of the Earth's climate.

(A) Irrelevant
(B) Insoluble
(C) Unavoidable
(D) Invisible

35. She became a recluse to focus on her writing.

(A) Refugee
(B) Hermit
(C) Wanderer
(D) Teacher

Directions **(Q. Nos. 36–40) : In these questions, out of four alternatives given, choose the one which is opposite in meaning of the underlined word.**

36. He gave his mother an affectionate hug.

(A) Aloof
(B) Adoring
(C) Enthusiastic
(D) Hasty

37. They only had a vague idea where the place was.

(A) Slight
(B) Specific
(C) Great
(D) Common

38. Walking is an effective way to stay fit.

(A) Energetic
(B) Active
(C) Ideal
(D) Inefficient

39. The store saw a significant increase in sales.

(A) Steady
(B) Small
(C) Rapid
(D) Stagnant

40. He had an influential role in the new project.

(A) Interesting
(B) Indirect
(C) Unimportant
(D) Extreme

***Directions* (Q. Nos. 41–50) : Choose the correct meaning for the phrases or idioms given below.**

41. Piece of cake means

(A) something very easy

(B) something very soft

(C) something very hard

(D) something very sweet

42. Spill the beans means

(A) to make a mess

(B) to plant seeds

(C) to reveal a secret

(D) to fall down

43. Jump the gun means

(A) to do something risky

(B) to do something fast

(C) to do something foolish

(D) to do something too early

44. Throw in the towel means

(A) to have a bath

(B) to start afresh

(C) to give up

(D) to help someone

45. Bread and butter means

(A) source of income

(B) source of food

(C) source of dairy

(D) source of energy

46. Hit the sack means

(A) to exercise

(B) to earn a living

(C) to go to bed

(D) to give up

47. On cloud nine means

(A) being extremely happy

(B) being extremely sad

(C) being extremely confused

(D) being extremely confident

48. Get cold feet means

(A) to become cold

(B) to become nervous

(C) to become strong

(D) to become ill

49. Under the weather means

(A) feeling unwell

(B) feeling angry

(C) feeling sad

(D) feeling envious

50. Take a rain check means

(A) to travel

(B) to review

(C) to prepone

(D) to postpone

PART—B : GENERAL KNOWLEDGE

(*Marks* : 50)

Each question carries **2** marks

51. Which States of India have common border with Myanmar?

(A) Arunachal Pradesh, Nagaland, Manipur, Mizoram

(B) Arunachal Pradesh, Assam, Manipur, Mizoram

(C) Manipur, Mizoram, Nagaland, Tripura

(D) Nagaland, Mizoram, Meghalaya, Manipur

52. Which one of the following does ***not*** constitute the electoral college for electing the President of India?

(A) Elected members of the Lok Sabha

(B) Elected members of the Rajya Sabha

(C) Elected members of the Legislative Assembly of each State

(D) Elected members of the State Legislative Council

53. NITI Aayog works on the principle of

(A) Federalism

(B) Cooperative Federalism

(C) Centralization

(D) Democracy

54. Which was the immediate cause for the outbreak of the Revolt of 1857?

(A) Introduction of greased cartridges

(B) Widow remarriage

(C) Abolition of Sati

(D) Western education

55. India's first Mars Mission is called

(A) Chandrayaan

(B) Mangalyaan

(C) Gaganyaan

(D) Shukrayaan

56. The two fundamental aspects of Human Rights are

(A) social and legal aspects

(B) economic and political aspects

(C) natural and legal aspects

(D) economic and natural aspects

57. The site of Harappa is located in the bank of river

(A) Saraswati

(B) Beas

(C) Ravi

(D) Indus

58. RAM stands for

(A) Random Access Memory

(B) Read Access Memory

(C) Random Attribute Memory

(D) Random Applicable Memory

59. Which of the following phenomena of light results in a mirage?

(A) Refraction of light

(B) Reflection of light

(C) Total internal reflection of light

(D) Defraction of light

60. Global warming can be controlled by

(A) reducing deforestation, cutting down the use of fossil fuel

(B) reducing deforestation, increasing the use of fossil fuel

(C) increasing deforestation, slowing down the growth of human population

(D) increasing deforestation, reducing the efficiency of energy usage

61. The scientific process by which food crops are enriched with certain desirable nutrients is called

(A) crop protection

(B) breeding

(C) biofortification

(D) bioremediation

62. NABARD stands for

(A) National Bank for Agriculture and Rural Development

(B) National Agricultural Bank and Rural Development

(C) National Agricultural Board and Rural Development

(D) National Board for Agriculture and Rural Development

63. Sugar contains

(A) vitamins

(B) carbohydrates

(C) proteins

(D) All of the above

64. What is the exact sequence of atmospheric layers in ascending order from the surface of the Earth?

(A) Troposphere, Stratosphere, Mesosphere, Exosphere

(B) Troposphere, Exosphere, Mesosphere, Stratosphere

(C) Stratosphere, Mesosphere, Exosphere, Troposphere

(D) Exosphere, Troposphere, Mesosphere, Stratosphere

65. Who was the first Indian to win the Man Booker Prize?

(A) Arundhati Roy

(B) V. S. Naipaul

(C) Kiran Desai

(D) Salman Rushdie

66. The Right to Vote in election to the Parliament is a

(A) Fundamental Right

(B) Constitutional Right

(C) Legal Right

(D) Natural Right

67. Which of the following does ***not*** pollute the air?

(A) Carbon dioxide

(B) Carbon monoxide

(C) Sulphur dioxide

(D) Nitrogen dioxide

68. What does 'Global Dimming' mean?

(A) Increase in greenhouse gases

(B) Decrease in the Earth's rotation speed

(C) Gradual reduction in solar radiation reaching the Earth's surface

(D) Increase in ocean temperature

69. Which was the first newspaper of the British Government in India?

(A) *The Hindu*

(B) *The Times of India*

(C) *Bengal Gazette*

(D) *Bombay Herald*

70. Which gas is used in fire extinguisher?

(A) Nitrogen

(B) Carbon dioxide

(C) Oxygen

(D) Hydrogen

71. The Strait of Hormuz is bordered by which countries?

(A) Iran, The United Arab Emirates and Oman

(B) Iran, Oman and Saudi Arabia

(C) Iran, Saudi Arabia and Qatar

(D) Iran, Kuwait and Oman

72. The National Income divided by the total population is known as

(A) private income

(B) personal disposable income

(C) personal income

(D) per capita income

73. India signed a landmark free trade agreement (FTA) with which country in 2025?

(A) Australia

(B) United Kingdom

(C) China

(D) South Korea

74. The biggest-ever digital health platform in India, launched in 2021, is called

(A) eSanjeevani Plus

(B) Health Stock

(C) Bharat Digital Mission

(D) Ayushman Bharat Digital Mission

75. The amount of money in India is controlled by

(A) NITI Aayog

(B) the Government of India

(C) Commercial Banks

(D) the Reserve Bank of India

PART—C [Choose any ONE subject from the following]

ECONOMICS

(*Marks* : 150)

Each question carries **2** marks

76. In a market-oriented economy, which of the following best describes how goods and services are allocated?

(A) By government authorities based on central planning

(B) By consumer demand and the forces of supply and demand

(C) By equal distribution among all citizens

(D) By a lottery system among producers

77. Who was the Finance Minister of India in 1991, credited with steering the Indian economy away from a major economic crisis?

(A) Manmohan Singh

(B) Subramanian Swamy

(C) Urjit Patel

(D) Pranab Mukherjee

78. Which of the following acts as the banker to the Government of India?

(A) SBI (B) NABARD

(C) ICICI (D) RBI

79. Balance of payments includes

(A) visible items only

(B) invisible items only

(C) both visible and invisible items

(D) merchandise trade only

80. Loss of value of fixed assets because of unexpected obsolescence is called

(A) depreciation

(B) capital loss

(C) unexpected loss

(D) capital formation

81. The concept of elasticity of demand was introduced by

(A) Ferguson (B) Keynes

(C) Adam Smith (D) Marshall

82. Repo rate means

(A) rate at which the commercial banks are willing to lend to RBI

(B) rate at which the RBI is willing to lend to commercial banks

(C) exchange rate of the foreign banks

(D) growth rate of the economy

83. A farmer wants to take credit to meet his expenditure on agricultural inputs. Which of the following is ***not*** an institution he may approach for the credit?

(A) Regional Rural Banks (RRB)

(B) Commercial Bank

(C) National Bank for Agriculture and Rural Development

(D) Land Development Bank

84. Which of the following is/are key characteristic(s) of the informal sector in India?

(A) Formal employment contracts and job security

(B) Lack of social security benefits and irregular wages

(C) High level of occupational safety

(D) Fixed working hours

85. In the context of commercial bank, which of the following is correct?

(A) Note-issuing authority of the country

(B) Creates credit on the basis of cash reserves

(C) Accepts deposits from the general public

(D) Both (B) and (C)

86. In an economy, the value of indirect taxes is ₹ 200 crores and the value of net indirect taxes is (–) ₹ 250 crores. Identify the value of subsidies.

(A) ₹ 50 crores

(B) ₹ 450 crores

(C) (–) ₹ 450 crores

(D) ₹ 250 crores

87. When was NITI Aayog established?

(A) 1991 (B) 2001

(C) 2011 (D) 2015

88. Who is the father of Green Revolution in India?

(A) Pt. Jawaharlal Nehru

(B) A. M. Khusro

(C) M. S. Swaminathan

(D) V. K. R. V. Rao

89. An increase in price of good *X* leads to increase in demand of good *Y*. How are the goods related?

(A) Complementary goods

(B) Normal goods

(C) Inferior goods

(D) Substitute goods

90. In the context of India's development, what is the significance of the 'demographic dividend'?

(A) A surge in population growth

(B) A young and growing workforce

(C) A decline in workforce productivity

(D) An aging and declining workforce

91. Excess demand is a situation in which

(A) AD > AS at full employment level

(B) AD < AS at full employment level

(C) AD > AS at underemployment level

(D) AD < AS at underemployment level

92. The mean of first ten even numbers is

(A) 12 (B) 10

(C) 9 (D) 11

93. Which of the following is described as barometer of economic activity?

(A) Index number

(B) Correlation

(C) Arithmetic mean

(D) Standard deviation

94. If a firm's average cost is ₹ 32 at 6 units of output and ₹ 34 at 7 units of output, which one among the following is the marginal cost of producing the 7th unit?

(A) ₹ 46 (B) ₹ 2

(C) ₹ 36 (D) ₹ 42

95. The cost that cannot be recovered once spent is

(A) accounting cost

(B) fixed cost

(C) implicit cost

(D) sunk cost

96. What does a production possibility curve (PPC) illustrate in micro-economics?

(A) The allocation of resources in a specific firm

(B) The trade-offs between two goods an economy can produce efficiently

(C) The distribution of income within an economy

(D) The government's fiscal policy choices

97. Convexity of an indifference curve implies

(A) diminishing marginal rate of substitution

(B) perfect substitutability between goods

(C) constant marginal rate of substitution

(D) None of the above

98. Who has given scarcity definition of economics?

(A) Adam Smith (B) Marshall

(C) Robbins (D) Robertson

99. Product obtained from additional factors of production is termed as

(A) marginal product

(B) total product

(C) average product

(D) annual product

100. Long-run average cost curve is also called as _____ curve.

(A) demand (B) planning

(C) production (D) sales

101. The short-run production is studied through

(A) the law of returns to scale

(B) the law of variable proportions

(C) isoquants

(D) law of demand

102. Which of the following national income aggregates is generally recognized as national income of a country?

(A) Gross National Product at Factor Cost (GNP_{FC})

(B) Net National Product at Market Price (NNP_{MP})

(C) Net National Product at Factor Cost (NNP_{FC})

(D) Gross National Product at Market Price (GNP_{MP})

103. GNP = _____ + Net factor income from abroad.

(A) NNP

(B) NDP

(C) GDP

(D) Personal income

104. Firms in perfect competition face a

(A) perfectly elastic demand curve

(B) perfectly inelastic demand curve

(C) perfectly elastic supply curve

(D) perfectly inelastic supply curve

105. Which theory assumes ordinality of utility?

(A) Indifference curve theory

(B) Marginal utility theory

(C) Both (A) and (B)

(D) None of the above

106. Law of variable proportions holds when

(A) state of technology is same

(B) all units of variable factors are homogeneous

(C) there is at least one fixed factor

(D) All of the above

107. If the average product is decreasing, then the marginal product

(A) must be greater than the average product

(B) must be less than the average product

(C) must be increasing

(D) Both (A) and (C)

108. Suppose in a hypothetical economy, the income rises from ₹ 5,000 crores to ₹ 6,000 crores. As a result, the consumption expenditure rises from ₹ 4,000 crores to ₹ 4,600 crores. The marginal propensity to consume in such a case would be

(A) 0·8 (B) 0·4

(C) 0·2 (D) 0·6

109. Full employment implies the absence of

(A) voluntary unemployment

(B) involuntary unemployment

(C) unemployment

(D) None of the above

110. The concept of standard deviation was introduced by

(A) Croxton and Cowden

(B) A. L. Bowley

(C) Karl Pearson

(D) Charles Edward Spearman

111. In consumption function $C = \bar{c} + bY$, b represents

(A) autonomous consumption

(B) savings

(C) marginal propensity to consume (MPC)

(D) marginal propensity to save (MPS)

112. The Census of India is conducted under the supervision of the

(A) Reserve Bank of India (RBI)

(B) Election Commission

(C) NITI Aayog

(D) Registrar General of India

113. In case of Giffen's paradox, the slope of demand curve is

(A) negative

(B) positive

(C) parallel to X-axis

(D) parallel to Y-axis

114. Land reforms are

(A) technological reforms

(B) institutional reforms

(C) social reforms

(D) economic reforms

115. "Economics is the study of mankind in the ordinary business of life." Who said this?

(A) Lionel Robbins

(B) Adam Smith

(C) Alfred Marshall

(D) Samuelson

116. Autonomous investment is

(A) interest elastic

(B) income inelastic

(C) profit elastic

(D) income elastic

117. Economic liberalization in India started with

(A) substantial changes in industrial licensing policy

(B) the convertibility of Indian rupee

(C) doing away with procedural formalities for foreign direct investment

(D) significant reduction in tax rates

118. When the RBI announced an increase in Cash Reserve Ratio (CRR), what does it mean?

(A) The Union Government will have less money to lend

(B) The RBI will have less money to lend

(C) The commercial bank will have less money to lend

(D) All of the above

119. The algebraic sum of deviations of a set of n observations from their mean is

(A) n

(B) 1

(C) 0

(D) None of the above

120. Which one of the following is ***not*** a qualitative method of credit control?

(A) Margin requirements

(B) Bank rate policy

(C) Moral suasion

(D) Credit rationing

121. In the short run, which of the following always gets smaller as output increases?

(A) Average fixed cost

(B) Average variable cost

(C) Short-run average cost

(D) Short-run marginal cost

122. Which is ***not*** added in the calculation of national income in India?

(A) The value of goods and services

(B) Winning of a lottery

(C) Services rendered by housewives

(D) Both (B) and (C)

123. When two variables change in constant proportion, it is known as

(A) positive correlation

(B) negative correlation

(C) linear correlation

(D) non-linear correlation

124. The measures of dispersion can never be

(A) positive (B) zero

(C) negative (D) equal to 2

125. Which curve is ***not*** affected by fixed cost?

(A) MC curve (B) TC curve

(C) AC curve (D) AFC curve

126. The coefficient of correlation is used to

(A) measure the central tendency of a distribution

(B) measure the dispersion of a distribution

(C) measure the association between two variables

(D) None of the above

127. The production possibility curve drawn on the basis of two commodities does not change, when

(A) resources are increased

(B) commodity X is produced more efficiently

(C) both the commodities are produced more efficiently

(D) a greater amount of commodity X is produced at the expense of commodity Y

128. The investment multiplier does ***not*** exhibit which of the following characters?

(A) There is a direct relationship between the multiplier and the marginal propensity to consume

(B) There is an inverse relationship between the multiplier and the marginal propensity to save

(C) The minimum value of the multiplier is zero

(D) The maximum value of the multiplier is infinity

129. The value of coefficient of correlation (denoted by r) is always

(A) more than +1

(B) less than −1

(C) between −1 and +1

(D) between $-\infty$ and $+\infty$

130. Zero primary deficit means

(A) no liability with the government

(B) the government has to resort to borrowing only to meet interest payments

(C) no interest payment

(D) no current liability

131. Investments by the Indian residents in shares of foreign companies is recorded on which side of BOP Account?

(A) Credit side of Current Account

(B) Debit side of Current Account

(C) Credit side of Capital Account

(D) Debit side of Capital Account

132. A rise in price leads to a higher quantity supplied. This indicates

(A) increase in supply

(B) expansion of supply

(C) contraction of supply

(D) decrease in supply

133. "A student borrows ₹ 80,000 to finance his college fee. He plans to begin repaying the loan six months after his graduation, making payments over a span of ten years."

Based on the above text, identify the indicated function of money.

(A) Medium of exchange

(B) Unit of account

(C) Standard of deferred payments

(D) Store of value

134. What will be the total amount of money created in the system if legal reserves ratio is 20% and primary deposits are ₹ 1,000?

(A) ₹ 1,000 (B) ₹ 3,000

(C) ₹ 5,000 (D) ₹ 7,000

135. Identify the revenue expenditure from the following.

(A) Purchase of shares of PSUs

(B) Loans and advances

(C) Expenditure on acquisition of land

(D) Subsidies given to the public

136. Which of the following is a component of the Capital Account of balance of payments?

(A) Foreign direct investment

(B) Export of goods

(C) Remittance from abroad

(D) Interest received from foreign countries

137. As per the indifference curve analysis, consumer equilibrium is attained when

(A) slope of indifference curve is constant

(B) slopes of both indifference curve and income-price line are equal

(C) slopes of both indifference curve and income-price line are opposite

(D) both income-price line and indifference curve are parallel

138. The market structure which has large number of sellers selling differentiated product is called

(A) perfect competition

(B) monopoly

(C) monopolistic competition

(D) oligopoly

139. When the price of certain luxury goods increases, their demand also increases. This phenomenon is known as

(A) substitution effect

(B) Veblen effect

(C) demonstration effect

(D) Both (B) and (C)

140. When the price of good falls from ₹ 15 per unit to ₹ 12 per unit, its demand rises by 25 percent. Calculate the price elasticity of demand.

(A) 0·25 (B) 2

(C) 1 (D) 1·25

141. Which one of the following is a combination of direct taxes?

(A) Excise duty and wealth tax

(B) Service tax and income tax

(C) Wealth tax and income tax

(D) Excise duty and service tax

142. If the government's fiscal deficit is ₹ 500 crores and interest payments are ₹ 120 crores, then the primary deficit will be

(A) ₹ 620 crores (B) ₹ 380 crores

(C) ₹ 500 crores (D) ₹ 120 crores

143. Which of the following is the correct difference between physical and human capital?

(A) Physical capital can be sold but human capital cannot be sold

(B) Physical capital cannot be separated from its owner while human capital can

(C) Physical capital provides both private and social benefits while human capital provides only social benefits

(D) The depreciation of physical capital can be corrected with more investment while human capital will continue to deplete

144. The apex body that coordinates the activities of all institutions involved in the rural financing system is the

(A) National Bank for Allied Activities and Rural Development

(B) National Bank for Agriculture and Road Development

(C) Reserve Bank of India

(D) National Bank for Agriculture and Rural Development

145. Which of the following is ***not*** a 'factor payment'?

(A) Free uniform to defense personnel

(B) Salaries to the members of the Parliament

(C) Scholarship given to the students

(D) Rent paid to the owner of a building

146. A production function tells the firm

(A) the maximum it can expect to produce with a given mix of inputs

(B) the average it can expect to produce with a given mix of inputs

(C) the minimum it can expect to produce with a given mix of inputs

(D) the average level of production for other firms in the industry

147. When the intrinsic value of money and its face value are equal, it is called

(A) token money

(B) full-bodied money

(C) quasi-money

(D) fiat money

148. Which year is known as the 'Year of Great Divide' in the history of Indian demography?

(A) 1932

(B) 1931

(C) 1882

(D) 1921

149. Consider the following statements about utility :

I. As consumption increases marginal utility increases.

II. As consumption increases marginal utility decreases.

III. Utility does not differ from person to person.

IV. Total utility is the sum of marginal utilities.

Which of the above statements are correct?

(A) I and II only

(B) II and III only

(C) III and I only

(D) II and IV only

150. When the values of final goods and services are estimated at current price, it is

(A) real GDP

(B) GDP at constant prices

(C) nominal GDP

(D) consumer price index

STATISTICS

(*Marks* : 150)

Each question carries **2** marks

76. A five-digit number is formed using the digits 1, 3, 5, 7 and 9 without repeating any one of them. What is the sum of all such possible numbers?

(A) 6666660

(B) 6666600

(C) 6666666

(D) None of the above

77. Twelve points are marked on a straight line and thirteen points are marked on another straight line. How many triangles can be constructed with vertices from among the above points?

(A) 560

(B) 1794

(C) 2300

(D) 2475

78. According to binomial coefficients, the coefficient of x^5 in $(2x-3)^8$ is

(A) -48384

(B) 24192

(C) 48384

(D) -24192

79. The coefficient of x^3 in the expansion of $e^x(1+x)$ is

(A) $\frac{1}{2}$ (B) $\frac{2}{3}$

(C) $\frac{1}{3}$ (D) $\frac{1}{6}$

80. One red flag, three white flags and two blue flags are arranged in a line such that

(i) no two adjacent flags are of the same colour

(ii) the flags at the two ends of the line are of different colours

In how many different ways the flags can be arranged?

(A) 10 (B) 6

(C) 5 (D) 8

81. Which of the following is the assumption of interpolation and extrapolation?

(A) There is no violent fluctuation within the given series of data

(B) There should be regularity in variation of variate values

(C) The dependent and independent variables should have definite mathematical relationship

(D) All of the above

82. The forward difference operator is denoted by Δ. If $y_x = x^2 + x$, then Δy_x equals

(A) $2x+1$

(B) $2x+2$

(C) $x+1$

(D) x^2+1

83. If the observed values of x and function u_x are

x	2	6	8	9
u_x	198	150	102	93

the interpolation function u_x is

(A) $x^3 - 4x^2 + 80x + 102$

(B) $x^3 - 18x^2 + 80x + 294$

(C) $x^3 - 18x^2 + 80x + 102$

(D) None of the above

84. The most suitable formula for estimating a value lying in the central part of a series is

(A) Lagrange's formula

(B) Stirling formula

(C) Newton-Gauss forward formula

(D) Newton-Gauss backward formula

85. The relationship between the operators E and ∇ is

(A) $E = (1 - \nabla)$

(B) $E = (1 - \nabla)^{-1}$

(C) $E = (1 + \nabla)^{-1}$

(D) None of the above

86. Using the Newton backward interpolation formula for given values of x and y

x	1	2	3	4
y	1	4	9	16

the value of y at $x = 3 \cdot 5$ is

(A) 12·25

(B) 12

(C) 13·6

(D) 15

87. Taking h to be the interval of differencing, the value of $\Delta^2(e^x)$ is

(A) $e^x(e^h - 1)$

(B) $e^x(e^h - 1)^2$

(C) $e^h(e^x - 1)^2$

(D) $e^x(e^x - 1)^2$

88. Which method can be used for both equal and unequal intervals?

(A) Lagrange's method

(B) Divided difference method

(C) Newton's method

(D) Cubic spline method

89. The nth difference of a polynomial $f(x)$ of degree n is

(A) zero

(B) constant

(C) one

(D) None of the above

90. Three fair dice are thrown simultaneously. Given that the sum of the numbers obtained is 10, the probability that at least one dice shows 6 is

(A) $\frac{1}{9}$

(B) $\frac{1}{6}$

(C) $\frac{1}{3}$

(D) $\frac{2}{9}$

91. If A and B are two events such that $P(A) = 0 \cdot 2$, $P(B) = 0 \cdot 4$ and $P(A \cup B) = 0 \cdot 5$, then the value of $P(A \mid B)$ is

(A) $0 \cdot 5$

(B) $0 \cdot 1$

(C) $0 \cdot 25$

(D) $0 \cdot 08$

92. A coin and two dice are tossed. The probability that the coin shows head and the sum of dice is 7 is

(A) $\frac{1}{4}$

(B) $\frac{1}{6}$

(C) $\frac{1}{12}$

(D) $\frac{1}{2}$

93. In a city, 60 percent read newspaper A, 40 percent read newspaper B and 30 percent read newspaper C, 20 percent read A and B, 30 percent read A and C, and 10 percent read B and C. Also 15 percent read newspapers A, B and C. The percentage of people who do not read any of these newspapers is

(A) 65 percent

(B) 15 percent

(C) 45 percent

(D) None of the above

94. If the letters of the word 'REGULATIONS' be arranged at random, what is the chance that there will be exactly 4 letters between R and E?

(A) $\frac{6}{55}$ (B) $\frac{10}{50}$

(C) $\frac{8}{12}$ (D) $\frac{9}{40}$

95. Which of the following can never represent a probability distribution over a sample space?

(A) 0·2, 0·3, 0·5

(B) 0·1, 0·4, 0·6

(C) 0, 1

(D) 0·25, 0·25, 0·5

96. For two events A_1 and A_2, if $P(A_1) = \frac{2}{3}$, $P(A_2) = \frac{3}{8}$ and $P(A_1 \cap A_2) = \frac{1}{4}$, then A_1 and A_2 are

(A) mutually exclusive but not independent

(B) mutually exclusive and independent

(C) independent but not mutually exclusive

(D) not mutually exclusive and not independent

97. Mailed questionnaire method of enquiry can be adopted if respondents

(A) live in cities

(B) have high income

(C) are educated

(D) are known

98. The following frequency distribution

Classes	*Frequency*
0–15	17
0–10	8
0–5	3

is classified as

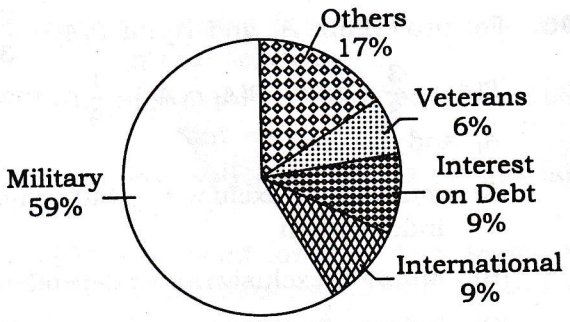
(A) cumulative distribution in less than type

(B) cumulative distribution in more than type

(C) discrete frequency distribution

(D) cumulative frequency distribution

***Directions*: The following pie diagram shows the 2000 India National Budget Expenditure (Percentage Allocation) :**



Study the above chart and answer the Question Nos. 99–101.

99. If 9 billion rupees were spent in the year 2000 for veterans, what would have been the total expenditure for that year in billions?

(A) 150 billion rupees

(B) 155 billion rupees

(C) 160 billion rupees

(D) 165 billion rupees

100. In 1999, India spent 11% of all expenditure on interest payments. To answer the question, "Did India spend more on interest payments in 1999 than 2000?"

(i) you do not require any additional data

(ii) you require to know the total amount spent in 1999 and 2000

(iii) you require to know the exact percentage breakup of the various items of expenses in 1999

Choose the correct answer.

(A) Only (i)

(B) Only (ii)

(C) Only (i) and (ii)

(D) Only (i) and (iii)

101. If India in the year 2000 had a total expenditure of 120 billion rupees, approximately how many billions did it spend on interest on debt?

(A) 11 billion rupees

(B) 12 billion rupees

(C) 13 billion rupees

(D) 10·8 billion rupees

102. A man motors from *A* to *B*, a large part of the distance is uphill and he gets a mileage of only 10 miles per gallon of gasoline. On the return trip, he makes 15 miles per gallon. The average mileage is

(A) 12·5 miles per gallon

(B) 12 miles per gallon

(C) 12·2 miles per gallon

(D) 11·6 miles per gallon

103. If mean = 40 and coefficient of variation = 25%, then the standard deviation is

(A) 5

(B) 10

(C) 160

(D) 12

104. Given the values 15, 18, 10, 30, 36, 25, the median is

(A) 18·5

(B) 19·84

(C) 21·50

(D) 22·33

105. The following is the wage distribution of workers :

Wages (in ₹)	2000–3000	3000–4000
No. of workers	3	5

4000–5000	5000–6000	6000–7000
20	10	5

The median wage was

(A) ₹ 4675·00

(B) ₹ 4230·00

(C) ₹ 3788·00

(D) None of the above

106. A train covered the first 5 km of its journey at a speed of 30 km/h and the next 15 km at a speed of 45 km/h. The average speed of the train was

(A) 37·5 km/h

(B) 40 km/h

(C) 32 km/h

(D) 42 km/h

107. If the mean and standard deviation of A and B are as $\bar{X}_A = 15 \cdot 0$, $\bar{X}_B = 20 \cdot 0$, and $\sigma_A^2 = 25$ and $\sigma_B^2 = 16$, which of the two series is more consistent?

(A) Series A

(B) Series B

(C) Series A and B are equally consistent

(D) None of the above

108. Having known the population of two consecutive censuses, the formula for population estimate $\hat{P}_t$ in the inter-censal year t with usual notation is

(A) $\hat{P}_t = P_0 + \frac{N}{n}(P_1 - P_0)$

(B) $\hat{P}_t = P_1 + \frac{n}{N}(P_1 - P_0)$

(C) $\hat{P}_t = P_0 + \frac{n}{N}(P_1 - P_0)$

(D) $\hat{P}_t = P_0 + \frac{N}{n}(P_0 - P_1)$

109. The death rate of women due to delivery of children is termed as

(A) neonatal mortality rate

(B) infant mortality rate

(C) maternal mortality rate

(D) women mortality rate

110. Age-specific mortality rates fail to reveal

(A) mortality conditions

(B) age distribution of persons

(C) sex ratio

(D) All of the above

111. A population having constant size and composition is called a

(A) stable population

(B) stationary population

(C) continuous population

(D) discrete population

112. Two random variables X and Y are said to be independent if

(A) $E(XY) = 1$

(B) $E(XY) = 0$

(C) $E(XY) = E(X)E(Y)$

(D) $E(XY)$ = any constant value

113. Let X be a random variable with the following probability distribution :

x	-3	6	9
$P(X = x)$	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

The value of $E(2X + 1)^2$ is

(A) 201

(B) 150

(C) 209

(D) 350

114. An urn contains 8 white and 4 red balls. 2 balls are drawn together, at random from this urn. The expected number of white balls drawn is

(A) $\frac{2}{5}$

(B) $\frac{4}{3}$

(C) $\frac{7}{10}$

(D) None of the above

115. A random variable X possesses the following function :

x	$+3$	$+2$	$+1$	0	-1	-2	-3
$P(X = x)$	0·1	0·2	$3k$	k	$2k$	0	0·1

The respective values of k and $E(X)$ are

(A) $k = 0 \cdot 2$ and $E(X) = 0 \cdot 5$

(B) $k = 0 \cdot 1$ and $E(X) = 0 \cdot 5$

(C) $k = 0 \cdot 5$ and $E(X) = 0 \cdot 3$

(D) $k = 0 \cdot 4$ and $E(X) = 0 \cdot 5$

116. A bag contains 9 balls which are numbered from 1 to 9. 3 balls are drawn without replacement from this. The expectation of the sum of the numbers on these balls is

(A) 15

(B) 25

(C) 30

(D) 19

117. If $X \sim B\left(3, \frac{1}{2}\right)$ and $Y \sim B\left(5, \frac{1}{2}\right)$, the probability $P(X + Y = 3)$ is

(A) $\frac{7}{16}$

(B) $\frac{7}{32}$

(C) $\frac{11}{16}$

(D) None of the above

118. A random variable X has the probability density function as follows :

$$f(x)=\begin{cases}\frac{1}{4}, & -2<x<2\\ 0, & \text{otherwise}\end{cases}$$

Then $P[(2X+3)>5]$ is equal to

(A) $\frac{3}{4}$ (B) $\frac{1}{4}$

(C) $\frac{1}{2}$ (D) $\frac{5}{6}$

119. Poisson distribution is a limiting form of binomial distribution in which

(A) $n\to\infty,\ p\to 0,\ np\to\infty$

(B) $n\to\infty,\ p\to 1,\ np\to\lambda$

(C) $n\to\infty,\ p\to 0,\ np\to\lambda$

(D) $n\to\infty,\ p\to 1,\ np\to\infty$

120. If X is a normal variate with mean 20 and variance 64, the probability that X lies between 12 and 32 is

Given $\begin{bmatrix} Z & : & -1\cdot0 & 1\cdot5 \\ \phi(z) & : & 0\cdot3413 & 0\cdot4332 \end{bmatrix}$

(A) 0·7745 (B) 0·7475

(C) 0·7574 (D) 0·7754

121. X is a binomial variate with parameters n and p. If $n=1$, the distribution of X reduces to

(A) Poisson distribution

(B) uniform distribution

(C) Bernoulli distribution

(D) exponential distribution

122. For Bernoulli distribution with probability p of a success and q of a failure, the relation between Mean and Variance that holds is

(A) Mean < Variance

(B) Mean > Variance

(C) Mean = Variance

(D) Mean ≤ Variance

123. In a negatively skewed distribution, the relation among Mean, Median and Mode is

(A) Mean < Median < Mode

(B) Mode < Median < Mean

(C) Median < Mode < Mean

(D) Mode < Mean < Median

124. If X and Y are two Poisson variates such that $X\sim P(1)$ and $Y\sim P(2)$, the probability $P(X+Y<3)$ is

(A) e^{-3}

(B) $3e^{-3}$

(C) $4e^{-3}$

(D) $8\cdot5e^{-3}$

125. 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) $\frac{1}{2^8}$

126. Match Column–I with Column–II :

Column–I	*Column–II*
a. Laspeyres' index formula	1. $P_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$
b. Paasche's index formula	2. $P_{01} = \frac{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} + \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}}{2} \times 100$
c. Dorbish and Bowley index formula	3. $P_{01} = \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$
d. Fisher's ideal formula	4. $P_{01} = \sqrt{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}} \times 100$

Select the correct answer from the options given below.

(A)	a	b	c	d
	4	1	3	2
(B)	a	b	c	d
	3	1	2	4
(C)	a	b	c	d
	3	2	4	1
(D)	a	b	c	d
	2	4	3	1

127. Base period of an index number should be

(A) a year only

(B) a normal period

(C) a period at distant past

(D) None of the above

128. Which index satisfies factor reversal test?

(A) Paasche's index

(B) Laspeyres' index

(C) Fisher's ideal index

(D) Walsh's price index

129. The consumer price index numbers for 1981 and 1982 to the base 1974 are 320 and 400, respectively. The consumer price index for 1981 to the base 1982 is

(A) 125

(B) 80

(C) 128

(D) None of the above

130. If Laspeyres' price index is 324 and Paasche's price index is 144, then Fisher's ideal index is

(A) 234

(B) 180

(C) 216

(D) None of the above

131. Consumer price index number is constructed for

(A) a well-defined section of people

(B) all people

(C) factory workers only

(D) All of the above

132. A time series consists of

(A) two components

(B) three components

(C) four components

(D) five components

133. The component of a time series attached to long-term variations is termed as

(A) cyclic variation

(B) secular trend

(C) irregular variation

(D) All of the above

134. Cyclic variation in a time series is caused by

(A) lockout in a factory

(B) war in a country

(C) floods in the States

(D) None of the above

135. A mixed model of a time series with components T, S, C and I is

(A) $I = \frac{Y}{S} \times C \times T$

(B) $Y = T + S \times C + I$

(C) $Y = T + S + C + I$

(D) None of the above

136. Sampling is inevitable in which situation?

(A) Blood test of a person

(B) When the population is infinite

(C) Testing of life of dry battery cells

(D) All of the above

137. The number of possible samples of size n out of N population units without replacement is

(A) $\binom{N}{n}$ (B) $(N)^n$

(C) n^2 (D) $n!$

138. Having a sample observation

$x_1, x_2, \ldots, x_n$

the formula for variance is

(A) $S^2 = \frac{1}{n-1}\Sigma(x_i - \bar{x})^2$

(B) $S^2 = \frac{1}{n-1}\left\{\Sigma x_i^2 - \frac{(\Sigma x_i)^2}{n}\right\}$

(C) $S^2 = \frac{1}{n-1}(\Sigma x_i^2 - n\bar{x}^2)$

(D) All of the above

139. A sample of 16 items from an infinite population having SD = 4, yields total score as 160. The standard error of sampling distribution of mean is

(A) 1

(B) 10

(C) 40

(D) None of the above

140. A population is divided into clusters and it has been found that all items within a cluster are alike. Which of the following sampling procedures would you adopt?

(A) Simple random sampling

(B) Cluster sampling

(C) Stratified sampling

(D) Systematic sampling

141. A sampling frame is a term used for

(A) a list of voters

(B) a list of sampling units of a population

(C) a list of random numbers

(D) None of the above

142. In a heterogeneous population, a sample is drawn by simple random sampling without replacement (SRSWOR) and stratified random sampling (Strat), the variance of the sample mean is related as

(A) $V(\bar{y})_{SRSWOR} < V(\bar{y})_{Strat}$

(B) $V(\bar{y})_{SRSWOR} > V(\bar{y})_{Strat}$

(C) $V(\bar{y})_{SRSWOR} = V(\bar{y})_{Strat}$

(D) None of the above

143. The variance of the sample mean under SRSWOR is

(A) $\frac{S^2}{N}$ (B) $\left(1-\frac{n}{N}\right)\frac{S^2}{n}$

(C) $\frac{S^2}{n^2}$ (D) $\frac{NS^2}{n}$

144. A population consists of 500 students, and 50 students are selected randomly from the complete list of all 500 students, with every student having an equal chance of being selected. Which of the following sampling procedures would you adopt?

(A) Simple random sampling

(B) Cluster sampling

(C) Systematic sampling

(D) Stratified sampling

145. The discrepancy between estimates and population parameters is known as

(A) human error

(B) enumeration error

(C) sampling error

(D) formula error

146. Sampling error can be reduced by

(A) choosing a proper probability sampling

(B) selecting a sample of adequate size

(C) using a suitable formula for estimation

(D) All of the above

147. If the sample values are 1, 3, 5, 7, 9, the standard error of sample mean is

(A) $SE = \sqrt{2}$ (B) $SE = \frac{1}{\sqrt{2}}$

(C) $SE = 2 \cdot 0$ (D) $SE = \frac{1}{2}$

148. The probability of including a specified unit in a sample of size n selected out of N units is

(A) $\frac{1}{n}$ (B) $\frac{1}{N}$

(C) $\frac{n}{N}$ (D) $\frac{N}{n}$

149. An unordered sample of size n selected from a population can occur in

(A) n ways

(B) $n!$ ways

(C) one way

(D) n^2 ways

150. If the items are destroyed under investigation, we have to go for

(A) complete enumeration

(B) sampling studies

(C) Both (A) and (B)

(D) Neither (A) nor (B)

MATHEMATICS

(*Marks* : 150)

Each question carries **2** marks

76. The number of relations from a set A with 2 elements to itself is

(A) 4 (B) 8

(C) 16 (D) 32

77. The range of $f(x)=x^2$ is

(A) $\mathbb{R}$

(B) $[0,\infty)$

(C) $(-\infty,\infty)$

(D) None of the above

78. If $f(x)=|x|$, then f is

(A) neither one-one nor onto

(B) onto

(C) one-one

(D) bijective

79. The relation $R=\{(a,b):a,b\in\mathbb{N},a<b\}$ is

(A) reflexive

(B) symmetric

(C) transitive

(D) None of the above

80. If $f(x)=x+1$ and $g(x)=x^2$, then $(f\circ g)(2)$ is

(A) 3 (B) 5

(C) 9 (D) 7

81. If $\sin^{-1}(x)=y$, then

(A) $0\le y\le\pi$

(B) $-\frac{\pi}{2}\le y\le\frac{\pi}{2}$

(C) $0<y<\pi$

(D) $-\frac{\pi}{2}<y<\frac{\pi}{2}$

82. The principal value of $\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)$ is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$

(C) $\frac{2\pi}{3}$ (D) $\frac{5\pi}{6}$

83. The principal value branch of the function $\tan^{-1}(x)$ is

(A) $[0,\pi]$ (B) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$

(C) $(-\infty,\infty)$ (D) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$

84. The value of $\sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{4}{5}\right)$ is equal to

(A) $2\sin^{-1}\left(\frac{3}{5}\right)$ (B) $\frac{\pi}{2}$

(C) $\tan^{-1}\left(\frac{3}{4}\right)$ (D) $\cos^{-1}\left(\frac{3}{5}\right)$

85. The order of a matrix with 3 rows and 4 columns is

(A) 3×3

(B) 3×4

(C) 4×3

(D) None of the above

86. If $A=\begin{bmatrix}1&2\\3&4\end{bmatrix}$, then $\text{tr}(A)$ is

(A) 1 (B) 4

(C) 5 (D) 6

87. If $\begin{bmatrix} x+y & 1 \\ 2y & 5 \end{bmatrix} = \begin{bmatrix} 7 & 1 \\ 4 & 5 \end{bmatrix}$, then the value of x is

(A) 2 (B) 3

(C) 4 (D) 5

88. The product $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} [1\ 2\ 3]$ is equal to

(A) $[1\ 2\ 3]$ (B) $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix}$

89. If the matrix A is both symmetric and skew-symmetric, then

(A) A is a diagonal matrix

(B) A is a zero matrix

(C) A is a square matrix

(D) None of the above

90. The inverse of $A = \begin{bmatrix} 2 & -2 \\ 4 & 3 \end{bmatrix}$ is

(A) $\begin{bmatrix} \frac{3}{14} & \frac{1}{7} \\ -\frac{2}{7} & \frac{1}{7} \end{bmatrix}$

(B) $\begin{bmatrix} \frac{3}{10} & -\frac{2}{5} \\ \frac{2}{5} & \frac{2}{5} \end{bmatrix}$

(C) $\begin{bmatrix} -\frac{2}{7} & \frac{3}{14} \\ \frac{1}{7} & \frac{1}{7} \end{bmatrix}$

(D) None of the above

91. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then $A'A$ equals

(A) $-I$ (B) 0

(C) A (D) I

92. If two rows of a determinant are identical, then its value is

(A) 0

(B) 1

(C) -1

(D) None of the above

93. $\det \begin{bmatrix} 3 & 4 \\ 2 & 5 \end{bmatrix}$ equals

(A) -7

(B) 15

(C) 7

(D) None of the above

94. If $\det(A) = 4$, then $\det(A^{-1})$ is

(A) 1/4

(B) 4

(C) -4

(D) None of the above

95. If $\det(A) = 0$, then A is

(A) non-singular

(B) singular

(C) identity

(D) None of the above

96. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$, then $\det(3A)$ is

(A) 3 (B) 9

(C) 27 (D) 81

97. If $\det(A)=2$, then $\det(\text{adj}(A))$ for a 3×3 matrix is

(A) 4

(B) 8

(C) 16

(D) None of the above

98. The area of the triangle with vertices $(0,0),(4,0),(0,3)$ is

(A) 6 (B) 12

(C) 3 (D) 9

99. The function $f(x)=\sqrt{(x-1)(x-2)}$ is continuous for

(A) $[1,2]$ (B) $(-\infty,1]\cup[2,\infty)$

(C) $[2,\infty)$ (D) $(-\infty,\infty)$

100. The function $f(x)=\tan x$ is discontinuous at

(A) $x=0$

(B) $x=\frac{\pi}{2}$

(C) $x=\pi$

(D) None of the above

101. $\lim\limits_{x\to0}\frac{\sin x}{x}$ equals

(A) 0

(B) ∞

(C) 1

(D) None of the above

102. If $f(x)=\begin{cases} kx & , x\le5 \\ 3x-5 & , x>5 \end{cases}$, then the value of k, so that $f(x)$ is continuous at $x=5$, is

(A) 2 (B) 3

(C) 4 (D) 5

103. If $f(x)=|x|$, then the derivative at $x=0$ is

(A) 0

(B) 1

(C) Does not exist

(D) None of the above

104. The derivative of e^{2x} is

(A) e^{2x} (B) $2e^{x}$

(C) $2e^{2x}$ (D) $\frac{1}{e^{2x}}$

105. The derivative of x^{x} is

(A) x^{x}

(B) $x^{x}(1+\ln x)$

(C) $x^{x}\ln x$

(D) None of the above

106. If $x=\cos t, y=\cos 2t$, then $\frac{dy}{dx}$ is

(A) $4\cos t$ (B) $2\sin t$

(C) $\frac{2}{\cos t}$ (D) $\frac{2}{\sin t}$

107. If $y=\ln x$, then $\frac{d^2y}{dx^2}$ is

(A) $\frac{1}{x}$ (B) $-\frac{1}{x^2}$

(C) $\frac{1}{x^2}$ (D) 0

108. The slope of the normal to $y=x^2$ at $x=3$ is

(A) $-\frac{1}{4}$ (B) $-\frac{1}{2}$

(C) -2 (D) $-\frac{1}{6}$

109. The function $f(x) = x^2 - 4x + 6$ is increasing in the interval

(A) $(-\infty, 2)$ (B) $(2, \infty)$

(C) $(-\infty, \infty)$ (D) $(-\infty, -2)$

110. If $y = x^3 - 3x$, then the critical points are

(A) $(1, -2), (-1, 2)$

(B) $\pm\sqrt{3}$

(C) $0, \pm\sqrt{3}$

(D) None of the above

111. A circular disc of radius 3 cm is being heated. Its radius increases at the rate of 0·05 cm/s. Find the rate at which its area is increasing when the radius is 3·2 cm.

(A) $0{\cdot}32\pi$ cm^2/s

(B) $0{\cdot}50\pi$ cm^2/s

(C) $1{\cdot}00\pi$ cm^2/s

(D) $2{\cdot}00\pi$ cm^2/s

112. Consider the function

$$f(x) = 2x^3 - 6x^2 + 6x + 5$$

At the critical point(s), the function has

(A) local maxima

(B) local minima

(C) point of inflexion

(D) None of the above

113. The minimum value of the function $f(x) = (2x - 1)^2 + 3$ is

(A) 0 (B) 1

(C) 2 (D) 3

114. In the interval $[0, 2\pi]$, the function $f(x) = \sin 2x$ attains its maximum value at

(A) $\frac{\pi}{4}, \frac{5\pi}{4}$ (B) $\frac{\pi}{2}, \frac{3\pi}{2}$

(C) $\frac{\pi}{6}, \frac{7\pi}{6}$ (D) $\frac{\pi}{3}, \frac{4\pi}{3}$

115. The integral of $\frac{1}{x}$ with respect to x is

(A) $\ln|x| + C$ (B) $e^x + C$

(C) $\frac{x^2}{2} + C$ (D) $\frac{1}{x^2} + C$

116. If f is continuous on $[a, b]$ and F is an antiderivative of f, then

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

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

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

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

117. If $f(x)$ is an even function, i.e., $f(-x) = f(x)$, then which of the following is true?

(A) $\int_{-a}^{a} f(x)\,dx = 0$

(B) $\int_{-a}^{a} f(x)\,dx = 2\int_0^a f(x)\,dx$

(C) $\int_{-a}^{a} f(x)\,dx = \int_0^a f(x)\,dx$

(D) $\int_{-a}^{a} f(x)\,dx = -2\int_0^a f(x)\,dx$

118. $\int xe^x dx$ equals

(A) $(x-1)e^x + C$

(B) $(x+1)e^x + C$

(C) $x^2e^x + C$

(D) $e^x + C$

119. The value of the integral

$$I = \int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$$

is

(A) $\frac{\pi}{8}$ (B) $\frac{\pi}{4}$

(C) $\frac{1}{2}$ (D) $\frac{\pi}{2}$

120. $I = \int_0^2 |x-1| dx$ is equal to

(A) 1 (B) 2

(C) 3 (D) 4

121. The area of the region bounded by the curve $y = f(x)$, the x-axis, and the lines $x = a$ and $x = b\,(b > a)$ is given by

(A) $\int_a^b f(x)\,dy$

(B) $\int_a^b f(x)\,dx$

(C) $\int_a^b y\,dy$

(D) $\int_a^b x\,dx$

122. The area of the region bounded by the parabola $y^2 = 4x$, the y-axis, and the line $y = 2$ in the first quadrant is

(A) $\frac{2}{3}$ (B) 1

(C) $\frac{4}{3}$ (D) 2

123. The order of the differential equation

$$2x^2 \frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$$

is

(A) 0 (B) 1

(C) 2 (D) not defined

124. The degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$$

is

(A) 3 (B) 2

(C) 1 (D) not defined

125. A differential equation of the form $\frac{dy}{dx} = F(x, y)$ is said to be homogeneous if

(A) $F(x, y)$ is a homogeneous function of degree one

(B) $F(x, y)$ is a homogeneous function

(C) $F(x, y)$ is a polynomial in x and y

(D) $F(x, y)$ is independent of x

126. The integrating factor of the differential equation $x\frac{dy}{dx} - y = 2x^2$ is

(A) e^{-x} (B) e^{-y}

(C) $\frac{1}{x}$ (D) x

127. The number of arbitrary constants in the particular solution of a differential equation of third order is

(A) 0 (B) 3

(C) 2 (D) 1

128. The general solution of the differential equation $e^x dy + (ye^x + 2x)\,dx = 0$ is

(A) $xe^y + x^2 = C$

(B) $xe^y + y^2 = C$

(C) $ye^x + x^2 = C$

(D) $ye^y + x^2 = C$

129. The position vector of a point $P(x, y, z)$ is given by $\overrightarrow{OP} = x\hat{i} + y\hat{j} + z\hat{k}$. Its magnitude is

(A) $x + y + z$

(B) $\sqrt{x^2 + y^2 + z^2}$

(C) $x^2 + y^2 + z^2$

(D) $\sqrt{x + y + z}$

130. The scalar product of two vectors $\vec{a}$ and $\vec{b}$ having angle θ between them is defined as

(A) $\vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}|\sin\theta$

(B) $\vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}|\cos\theta$

(C) $\vec{a} \cdot \vec{b} = |\vec{a}| + |\vec{b}|$

(D) $\vec{a} \cdot \vec{b} = \frac{|\vec{a}|}{|\vec{b}|}$

131. If $\vec{a}$ is a non-zero vector of magnitude a and λ is a non-zero scalar, then $\lambda\vec{a}$ is a unit vector if

(A) $\lambda = 1$ (B) $\lambda = -1$

(C) $a = |\lambda|$ (D) $a = \frac{1}{|\lambda|}$

132. The projection of the vector $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$ is

(A) $\frac{10}{\sqrt{6}}$ (B) $\frac{12}{\sqrt{6}}$

(C) $\frac{14}{\sqrt{6}}$ (D) $\frac{16}{\sqrt{6}}$

133. The value of $\hat{i}\cdot(\hat{j}\times\hat{k}) + \hat{j}\cdot(\hat{i}\times\hat{k}) + \hat{k}\cdot(\hat{i}\times\hat{j})$ is

(A) 0 (B) –1

(C) 1 (D) 3

134. If θ is the angle between any two vectors $\vec{a}$ and $\vec{b}$, then $|\vec{a}\cdot\vec{b}|=|\vec{a}\times\vec{b}|$ when θ is equal to

(A) 0 (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{2}$ (D) π

135. If l, m and n are the direction cosines of a line, then which of the following is true?

(A) $l^2+m^2+n^2=0$

(B) $l^2+m^2+n^2=2$

(C) $l^2+m^2+n^2=1$

(D) $l^2+m^2+n^2=-1$

136. The vector equation of a line passing through the points with position vectors $\vec{a}$ and $\vec{b}$ is

(A) $\vec{r}=\vec{a}+\lambda(\vec{b}+\vec{a})$

(B) $\vec{r}=\vec{a}+\lambda(\vec{b}-\vec{a})$

(C) $\vec{r}=\vec{b}+\lambda(\vec{a}-\vec{b})$

(D) $\vec{r}=\lambda(\vec{a}+\vec{b})$

137. The equation of a plane at a distance d from the origin with direction cosines of the normal as l, m and n is

(A) $lx+my+nz=0$

(B) $lx+my+nz=1$

(C) $lx+my+nz=d$

(D) $lx+my+nz=-d$

138. If a line has direction ratios $2,-1,-2$, then its direction cosines are

(A) $\left(\frac{2}{3},\frac{-1}{3},\frac{-2}{3}\right)$

(B) $\left(\frac{2}{\sqrt{10}},\frac{-1}{\sqrt{10}},\frac{-2}{\sqrt{10}}\right)$

(C) $\left(\frac{2}{9},\frac{-1}{9},\frac{-2}{9}\right)$

(D) $\left(\frac{2}{\sqrt{5}},\frac{-1}{\sqrt{5}},\frac{-2}{\sqrt{5}}\right)$

139. The planes $2x-y+4z=5$ and $5x-2\cdot5y+10z=6$

(A) are perpendicular

(B) pass through $\left(0,0,\frac{5}{4}\right)$

(C) intersect the y-axis

(D) are parallel

140. The angle between the planes $2x+y-2z=5$ and $3x-6y-2z=7$ is

(A) $\cos^{-1}\left(\frac{4}{21}\right)$

(B) $\cos^{-1}\left(\frac{1}{2}\right)$

(C) $60°$

(D) $90°$

141. The objective function in linear programming is usually

(A) quadratic

(B) linear

(C) cubic

(D) constant

142. If the feasible region is unbounded, then

(A) the problem has no solution

(B) the solution is always infinite

(C) the optimal solution may or may not exist

(D) the solution is always unique

143. In a maximization problem, if all coefficients of the objective function are negative, then

(A) the maximum value is positive

(B) the maximum value is negative

(C) the maximum value occurs at the origin

(D) the problem has no feasible solution

144. If two corner points of the feasible region both give the same optimal value (maximum or minimum), then

(A) only those two corner points are optimal solutions

(B) the objective function must be constant everywhere

(C) the feasible region has no optimal solution

(D) any point on the line segment joining those two points is also an optimal solution

145. The solution of the LPP

Maximize $Z = 3x + 4y$

subject to

$x + y \leq 4, x \geq 0, y \geq 0$

is

(A) maximum value = 12 at (4, 0)

(B) maximum value = 16 at (0, 4)

(C) maximum value = 14 at (2, 2)

(D) maximum value = 20 at (3, 3)

146. The probability of an impossible event is

(A) 0

(B) 1

(C) between 0 and 1

(D) undefined

147. In a die roll, the probability of getting an odd number is

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$

(C) $\frac{1}{2}$ (D) $\frac{5}{6}$

148. If $P(A) = 0 \cdot 4, P(B) = 0 \cdot 5$, and A, B are independent, then $P(A \cap B)$ is

(A) 0·25 (B) 0·9

(C) 0·1 (D) 0·2

149. A bag has 3 red and 5 blue balls. The probability of drawing 2 red balls without replacement is

(A) $\frac{3}{8}$ (B) $\frac{3}{28}$

(C) $\frac{15}{56}$ (D) $\frac{9}{56}$

150. Ten cards numbered 1 to 10 are placed in a box. One card is drawn at random. If it is known that the number on the drawn card is more than 3, what is the probability that it is an even number?

(A) $\frac{1}{2}$ (B) $\frac{3}{7}$

(C) $\frac{4}{7}$ (D) $\frac{5}{7}$