TRAINING OFFICER UNDER LABOUR DEPARTMENT

YEAR OF ADVT: 2018 DATE OF EXAM: 26-JUNE-2025

Booklet Serial No. 20037

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

SERIES : I

QUESTION BOOKLET

Subjects : General English, General Awareness & Aptitude and Mechanical Engineering/Electrical Engineering/ Computer Engineering

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	**:**	**25 questions**
Part—B : General Awareness & Aptitude	**:**	**25 questions**
Part—C : [Select any ONE subject from the following] Mechanical Engineering/Electrical Engineering/ Computer Engineering	**:**	**100 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* : 50)

Each question carries **2** marks

Directions **(Q. Nos. 1–4) : In these questions, some of the sentences have errors and some have none. Find out which part of a sentence (A), (B), (C) has an error and select that part as the answer. If there is no error, then (D) is the answer.**

1. I was afraid (A) / lest anyone (B) / should poke fun at me. (C) / No error (D)

2. He wiped his hand (A) / the flat of his hand (B) / and looking at the empty trencher, sighed. (C) / No error (D)

3. The young man was abundant (A) / by his parents (B) / at a very young age. (C) / No error (D)

4. What is my work, I ask you (A) / I have to go around everyday (B) / and see that it is done properly. (C) / No error (D)

Directions **(Q. Nos. 5 and 6) : Rearrange the parts of the sentence in correct order and mark the correct option from the given four alternatives.**

5. It is a matter of

P. of common knowledge

Q. that a stone that has been lying long

R. in one place gathers no moss

(A) QRP

(B) PQR

(C) RPQ

(D) PRQ

6. We need to ensure that AI

P. perpetuate existing ideas and discriminations

Q. so that it serves all members of society and ideas not

R. is developed with diversity and inclusivity in mind

(A) QRP

(B) PRQ

(C) RQP

(D) PQR

***Directions* (Q. Nos. 7 and 8) : Choose the one which can be substituted for the given words/phrase out of the four given alternatives.**

7. A newly coined word or expression

(A) Neologism

(B) Numismatics

(C) Epigraphy

(D) Etymology

8. A person who lends money at unreasonably high rates of interest.

(A) Money lender

(B) Financier

(C) Usurer

(D) Investor

***Directions* (Q. Nos. 9 and 10) : In the following questions four alternatives are given for idioms and phrases. Choose the one that best expresses the meaning of the given idioms/phrases.**

9. The pink of perfection

(A) in excellent condition

(B) in perfect health

(C) financially well-off

(D) excellent behaviour

10. As eager as a beaver

(A) extremely passionate

(B) extremely happy

(C) extremely hardworking and enthusiastic

(D) extremely careful

***Directions* (Q. Nos. 11–15) : In the following, there are blanks, each of which has been numbered. These numbers are printed below the passage and against each, four options are suggested, one of which fits the blank appropriately. Find out the appropriate word from the given options.**

Modernisation deals **(11)** social change from agrarian societies to industrial ones. So it important to **(12)** technology changes **(13)** context. New technologies do not change **(14)** by themselves. Rather it is the **(15)** to technology that causes change.

11. (A) in (B) with

(C) by (D) into

12. (A) look for (B) look at

(C) go for (D) make for

13. (A) across (B) within

(C) over (D) into

14. (A) economies (B) societies

(C) organizations (D) markets

15. (A) response (B) reaction

(C) action (D) listening

***Directions* (Q. Nos. 16–25) : Read the passage given below and answer the questions by selecting the answer from the given options.**

Edmund Burke called the Press the Fourth Estate of the realm. I think he did not use this title for the Press thoughtlessly as a social ruling group or class. The three Estates or Realms in England are the Lords Spiritual (i.e., the Bishops in the House of Lords), the Temporal (i.e., other Lords) and Commons (i.e., the common people). The Press has been rightly called the Fourth Estate as it also constitutes a ruling group or class like the Lords and Commons. It cannot be denied in a free country that the Press exercises a good deal of influence in shaping public opinion and pointing out the weaknesses or defects of society or of Government, and in general bringing to light all those good or bad things in society which would have otherwise remained unnoticed. The power is not limited or put under any check. The Press, instead of being controlled by anyone controls the life and thought of a nation. Hence the Press constitutes an Estate by itself.

Obviously, this power which the Press in any country wields depends upon the number of newspaper readers. The opinions and comments of newspapers can influence the life of a nation only when they are read by people. Reading in turn, requires that the general masses of people should be educated. Thus, the spread of education determines the extent of the newspapers. Where readers are few; newspapers must necessarily be few. Their influence, in that case can extend only to a small minority of population. In a country like India, the percentage of literacy is very low and the standard of journalism is not very high. So the Press has to play the role of a teacher here.

16. Edmund Burke called the Press

(A) instrument of public opinion

(B) distributor of news

(C) the Fourth Estate

(D) Lords Temporal

17. The term 'Fourth Estate' refers to

(A) an area of land

(B) landed property

(C) social ruling group or class

(D) instrument of power

18. Out of the following, which one is not included in the three Estates?

(A) Lords Spiritual

(B) Justices of the peace

(C) Lords Temporal

(D) Commons

19. The free Press does not perform the function of

(A) shaping public opinion

(B) supporting the official policy at all times

(C) criticising government

(D) exposing social abuses

20. How much power does a free Press possess?

(A) Unlimited power without any check

(B) Only that much power that is allowed by the Government of the country

(C) Unlimited power subject to the maintenance of law and order and public morality

(D) No power at all

21. The number of newspaper readers is determined by

(A) the low price of newspapers

(B) the patronage extended to it by the moneyed people

(C) education of the general masses

(D) availability of newsprint

22. The Press exercises power

(A) by enlisting the support of the people

(B) by keeping watch over the acts of the government

(C) by controlling the life and thought of a nation

(D) because it is a great moneyed concern

23. The state of journalism in India

(A) is up to the mark

(B) is not very high

(C) is rather low

(D) is in its infancy

24. The Press has the greatest chances of flourishing in a/an

(A) monarchy

(B) aristocracy

(C) democracy

(D) limited dictatorship

25. The secret of the Press is

(A) the money which the newspaper owners can wield

(B) the number of newspaper readers

(C) the extent to which it supports official policy

(D) the patronage enjoyed by it from the Government

PART—B : GENERAL AWARENESS & APTITUDE

(*Marks* : 50)

Each question carries **2** marks

26. The largest public sector undertaking in the country is

(A) railways

(B) airways

(C) roadways

(D) iron and steel plants

27. The Sagarmala Programme was launched by which ministry?

(A) Ministry of Jal Shakti

(B) Ministry of Commerce and Industry

(C) Ministry of Environment, Forest and Climate Change

(D) Ministry of Ports, Shipping and Waterways

28. Bandhavgarh Tiger Reserve is located in which State?

(A) Rajasthan

(B) Madhya Pradesh

(C) Gujarat

(D) Odisha

29. In North-East India, which is known to be the largest freshwater lake?

(A) Dal Lake

(B) Chilika Lake

(C) Loktak Lake

(D) Tsomoriri Lake

30. How much of longitude account for one hour?

(A) 10 degrees

(B) 15 degrees

(C) 20 degrees

(D) 25 degrees

31. Which organization developed the Pralay missile?

(A) Indian Space Research Organization (ISRO)

(B) Defence Research and Development Organization (DRDO)

(C) Hindustan Aeronautics Limited (HAL)

(D) Bharat Dynamics Limited (BDL)

32. Who among the following can pardon the Capital Punishment?

(A) President, Governor and Administrator of Union Territory

(B) President and Governor

(C) President and Administrator of Union Territory

(D) Only President

33. President Draupadi Murmu was awarded City Key of Honour in which European city?

(A) Rome, Italy

(B) Vienna, Austria

(C) Lisbon, Portugal

(D) Madrid, Spain

34. Which city will host the AI Action Summit, 2025?

(A) New York

(B) Paris

(C) Geneva

(D) Tokyo

35. Which organization released the Global Risks Report, 2025?

(A) International Monetary Fund

(B) United Nations Development Programme

(C) World Economic Forum

(D) United Nations Environment Programme

36. The Cyber Security Grand Challenge (CSGC) 2·0 has been launched by whom?

(A) Ministry of Defence and the Indian Army

(B) Ministry of Science and Technology and ISRO

(C) Ministry of Home Affairs and NITI Aayog

(D) Ministry of Technology and Data Security Council of India

37. Who was named ICC Women's Cricketer of the Year, 2024?

(A) Smriti Mandhana

(B) Ellyse Perry

(C) Amelia Kerr

(D) Alyssa Healy

38. What is the limit of non-taxable income as per the new regime, 2025?

(A) 10 lakhs

(B) 12 lakhs

(C) 11 lakhs

(D) 13 lakhs

39. On which date is Martyrs' Day observed in Meghalaya?

(A) January 26

(B) January 30

(C) February 15

(D) March 10

40. Who is the Chief Justice of the High Court of Meghalaya as of January 2025?

(A) Justice Indra Prasanna Mukerji

(B) Justice Dinesh Maheshwari

(C) Justice Ajay Kumar Mittal

(D) Justice Mohammad Yaqoob Mir

41. Today it is Thursday. After 132 days, it will be

(A) Monday

(B) Sunday

(C) Wednesday

(D) Thursday

42. Here are some words translated from an artificial language.

tamceno means sky blue
cenorax means blue cheese
aplmitl means star bright

Which word could mean 'bright sky'?

(A) cenotam

(B) mitltam

(C) raxmitl

(D) aplceno

43. In a certain code, 'BASE' is written as 'GUCD'. How is 'COMMAND' written in that code?

(A) FCIDSLN

(B) KOSFLKV

(C) FPCOOQE

(D) GNILDFW

44. *K* is the daughter of *A*'s mother's sister. *Q* is son of *D*, who is the father of *G* and grandfather of *A*. *P* is the daughter of *H* who is grandmother of *K*. *D* is husband of *H* and *G* is wife of *L*. Who is *K*'s mother?

(A) *D* (B) *H*

(C) *P* (D) *Q*

45. Find the odd one out from the given data :

EFG, BCE, JKL, ABC, NPO

(A) NPO (B) JKL

(C) BCE (D) ABC

46. In a row of 30 boys, when Harsh shifted six places towards the left, he became 9th from the left end. What was his earlier position from the right end of the row?

(A) 14th (B) 11th

(C) 13th (D) 15th

47. Two unbiased coins are tossed. What is the probability of getting at most one head?

(A) $\frac{3}{4}$ (B) $\frac{1}{6}$

(C) $\frac{1}{3}$ (D) $\frac{1}{2}$

48. RWKQ : PUIO :: FCGM : ?

(A) ABCD (B) UEJM

(C) DAEK (D) AQEI

49. One term in the following number series is wrong :

1, 3, 12, 25, 48

Find out the wrong term.

(A) 3 (B) 12

(C) 25 (D) 48

50. In alphabet series, some alphabets are missing which are given in that order as one of the alternatives below it :

ccbab__caa__bccc__a__

Choose the correct alternative.

(A) babb (B) bbba

(C) baab (D) babc

PART—C

(*Marks* : 200)

[Select any ONE subject from the following]

MECHANICAL ENGINEERING

Each question carries **2** marks

51. A rigid body is in equilibrium under the action of three coplanar, non-parallel forces. Which one of the following must be true?

(A) The forces are concurrent

(B) The forces form a triangle

(C) The sum of the magnitudes of the forces is zero

(D) The body must be stationary

52. In planar motion, the instantaneous center of rotation of a rigid body is a point

(A) with zero velocity

(B) with zero acceleration

(C) at which angular velocity is maximum

(D) that lies on the center of mass

53. A disc of radius R rolls without slipping on a horizontal surface. The velocity of the point of contact with the surface is

(A) zero

(B) equal to the translational velocity of the center

(C) equal to twice the translational velocity of the center

(D) in the opposite direction to the center's motion

54. The moment of inertia of a circular section about its diameter is

(A) $\pi d^4/32$

(B) $\pi d^4/64$

(C) $\pi d^3/16$

(D) $\pi d^2/4$

55. The force of friction always acts

(A) in the direction of motion

(B) perpendicular to the surface

(C) opposite to the direction of relative motion

(D) at the center of gravity

56. For a linear isotropic material, which of the following relations correctly links Young's modulus (E), shear modulus (G) and Poisson's ratio (ν)?

(A) $E = 2G(1-\nu)$

(B) $E = G(1+2\nu)$

(C) $E = 2G(1+\nu)$

(D) $E = G(1-2\nu)$

57. In a Mohr's circle representation of plane stress, the radius of the circle represents

(A) maximum principal stress

(B) average of normal stresses

(C) maximum shear stress

(D) minimum principal stress

58. For a simply supported beam under uniformly distributed load (UDL), the maximum bending moment

(A) occurs at the supports

(B) occurs at the mid-span

(C) occurs at the quarter-span

(D) depends on load magnitude

59. In the instantaneous center method for velocity analysis, the velocity of a point on a rigid body is

(A) directed perpendicular to the link

(B) along the link

(C) perpendicular to the line joining the point and the instantaneous center

(D) zero for all points

60. The inertia force in a reciprocating engine mechanism acts

(A) along the crank

(B) along the line of stroke

(C) tangential to the crank

(D) radially outward from the crank center

61. In an involute gear system, pressure angle affects

(A) pitch circle diameter only

(B) center distance and force transmission

(C) addendum only

(D) gear material selection

62. In an epicyclic gear train, the arm is fixed and the sun gear is rotated. What will happen to the planet gear?

(A) It rotates and revolves around the sun gear

(B) It only rotates

(C) It only revolves

(D) It moves in a straight line

63. A flywheel is primarily used to

(A) control temperature variations

(B) store energy and smoothen speed fluctuations

(C) maintain constant torque

(D) increase acceleration

64. The sensitivity of a governor increases when

(A) speed range increases

(B) speed range decreases

(C) radius of rotation is constant

(D) arm length is reduced

65. In belt drives, creep is due to

(A) improper belt tension

(B) variation in belt length

(C) elasticity of the belt

(D) slip between belt and pulley

66. At resonance in a forced vibration system with negligible damping, the amplitude becomes

(A) zero

(B) finite and small

(C) infinite

(D) constant regardless of excitation frequency

67. A rotating shaft experiences whirling at certain speed due to

(A) excessive damping

(B) shaft imbalance and critical speed coincidence

(C) torsional vibration

(D) axial loading

68. The first critical speed of a simply supported shaft with a central mass is primarily dependent on

(A) shaft diameter only

(B) shaft material only

(C) mass and stiffness distribution

(D) shaft length only

69. For ductile materials under complex stress states, the most suitable failure theory is

(A) maximum principal stress theory

(B) maximum shear stress theory

(C) maximum normal strain theory

(D) Coulomb-Mohr theory

70. In gears, interference can be avoided by

(A) using stub teeth

(B) increasing module

(C) decreasing pressure angle

(D) decreasing addendum

71. The load-carrying capacity of a rolling contact bearing is governed by

(A) material only

(B) the type of lubricant

(C) dynamic load rating and equivalent load

(D) shaft diameter

72. In a disk brake, the braking torque depends on

(A) brake pedal force only

(B) coefficient of friction, axial force and mean radius

(C) the number of pads only

(D) the angular speed of rotor

73. In turbulent flow, head loss is proportional to

(A) velocity

(B) velocity squared

(C) pressure

(D) flow rate

74. A floating body is said to be in stable equilibrium if

(A) the center of buoyancy is below the center of gravity

(B) the metacentric height is negative

(C) the metacenter lies above the center of gravity

(D) the buoyant force equals the weight of the fluid displaced

75. Bernoulli's equation is valid under which of the following conditions?

(A) Unsteady, compressible, viscous flow

(B) Steady, incompressible, inviscid flow along a streamline

(C) Rotational compressible flow

(D) For any control volume irrespective of flow conditions

76. In turbulent flow through a smooth pipe, the Darcy friction factor

(A) is independent of Reynolds number

(B) decreases with increasing Reynolds number

(C) increases with increasing Reynolds number

(D) remains constant regardless of flow regime

77. In a converging-diverging nozzle, to achieve supersonic flow at the exit, the flow must be

(A) subsonic throughout the nozzle

(B) choked at the throat with a pressure ratio below critical

(C) unchoked with low back pressure

(D) incompressible at all points

78. The effectiveness of a fin is increased by

(A) increasing the ambient temperature

(B) decreasing the thermal conductivity of the fin material

(C) increasing the surface area while maintaining high conductivity

(D) decreasing the surface area

79. Which dimensionless number represents the ratio of buoyancy forces to viscous forces in free convection?

(A) Nusselt number

(B) Reynolds number

(C) Grashof number

(D) Prandtl number

80. Mach number is defined as the ratio of

(A) velocity of fluid to velocity of sound

(B) pressure to density

(C) kinetic energy to pressure energy

(D) inertial force to viscous force

81. Which of the following represents a closed system?

(A) A gas-filled balloon leaking air

(B) A piston-cylinder arrangement with no mass exchange

(C) An open steam turbine

(D) A nozzle with continuous flow

82. The zeroth law of thermodynamics provides the basis for

(A) conservation of energy

(B) defining heat transfer

(C) defining entropy

(D) temperature measurement

83. In a quasi-static, reversible isothermal expansion of an ideal gas

(A) no work is done

(B) no heat transfer occurs

(C) work done = heat transferred

(D) internal energy increases

84. In a *T-s* diagram, the area under the process curve for a reversible process represents

(A) work done

(B) heat transfer

(C) change in enthalpy

(D) entropy generation

85. The irreversibility (or exergy destruction) in a real process is due to

(A) work interaction

(B) reversible adiabatic expansion

(C) entropy generation

(D) decrease in internal energy

86. In a Rankine cycle, the purpose of reheating is to

(A) reduce the size of the condenser

(B) increase the cycle efficiency and reduce blade erosion

(C) increase boiler pressure

(D) improve condenser heat rejection

87. In a regenerative Rankine cycle, thermal efficiency increases because

(A) more heat is rejected in the condenser

(B) less fuel is used in the boiler due to preheating

(C) the turbine work increases

(D) the compression work is reduced

88. For the same compression ratio and heat input, the efficiency ranking of air-standard cycles is

(A) Diesel > Otto > Dual

(B) Otto > Dual > Diesel

(C) Dual > Diesel > Otto

(D) Otto > Diesel > Dual

89. In a constant enthalpy process (like evaporative cooling), which of the following occurs?

(A) Dry-bulb and wet-bulb temperatures increase

(B) Dry-bulb temperature drops, relative humidity increases

(C) Specific humidity decreases

(D) Enthalpy and dry-bulb temperature remain unchanged

90. The reverse Brayton cycle (or Bell-Coleman cycle) is used in

(A) household refrigerators

(B) aircraft cooling systems

(C) automotive air conditioners

(D) steam power plants

91. Cast iron is manufactured by

(A) adding carbon to molten steel

(B) heating iron ore with coke

(C) remelting pig iron

(D) alloying iron with chromium

92. In an FCC structure, the lattice constant (a) and the atom radius (R) have the relationship

(A) $a = 4R/\sqrt{3}$

(B) $a = 2R$

(C) $a = 4R/\sqrt{2}$

(D) $a = \sqrt{3}/(4R)$

93. The angle between [1 1 1] and [1 1 $\bar{2}$] directions in a cubic crystal is

(A) 0°

(B) 45°

(C) 90°

(D) 180°

94. Crystal directions are defined as

(A) certain directions inside the crystal along which a large concentration of atoms exists

(B) certain directions inside the crystal along which a low concentration of atoms exists

(C) certain directions inside the crystal along which no atoms are present

(D) None of the above

95. The crystal structure of α-iron is

(A) simple cubic

(B) face-centered cubic

(C) body-centered cubic

(D) close-packed hexagonal

96. Which one of the following is ***not*** the purpose of full annealing?

(A) Refines grains

(B) Induces softness

(C) Removes stresses and strains

(D) Produces hardest material

97. The alloying element mainly used to improve the endurance strength of steel materials is

(A) nickel

(B) vanadium

(C) molybdenum

(D) tungsten

98. The ability of a material to undergo large permanent deformation in compression is known as

(A) ductility

(B) malleability

(C) brittleness

(D) hardness

99. A measure of Rockwell hardness is the

(A) depth of penetration of indenter

(B) surface area of indentation

(C) projected area of indentation

(D) height of rebound

100. The material property that depends only on the basic crystal structure is

(A) fatigue strength

(B) work hardening

(C) fracture strength

(D) elastic constant

101. TTT diagram indicates time and temperature transformation of

(A) cementite

(B) pearlite

(C) ferrite

(D) austenite

102. The angle made between the rake face of a tool and the normal to a workpiece is called

(A) clearance angle

(B) rake angle

(C) lip angle

(D) helix angle

103. Crater wear starts at some distance from the tool tip because

(A) cutting fluid cannot penetrate that region

(B) stress on rake face is maximum at that region

(C) tool strength is minimum at that region

(D) tool temperature is maximum at that region

104. Removal of metal in a drilling operation is done by

(A) shearing only

(B) compression only

(C) shearing and compression

(D) shearing and extrusion

105. The operation of making a cone-shaped enlargement at the end of a hole is called

(A) counter-sinking

(B) counter-boring

(C) spot facing

(D) step drilling

106. A hole of 1 mm diameter is to be drilled in glass. It could be best done by

(A) laser drilling

(B) plasma arc drilling

(C) ultrasonic method

(D) electron beam drilling

107. The purpose of chaplets is to

(A) provide venting

(B) induce directional solidification

(C) compensate shrinkage

(D) support the core

108. Misrun is a casting defect which occurs due to

(A) very high pouring temperature of the metal

(B) insufficient fluidity of the molten metal

(C) absorption of gases by the liquid metal

(D) improper alignment of the mould flasks

109. The shrinkage of metals during cooling in moulds includes

(A) liquid shrinkage only

(B) solid shrinkage only

(C) Both (A) and (B)

(D) None of the above

110. Which manufacturing process involves forcing metal through a die?

(A) Forging

(B) Extrusion

(C) Rolling

(D) Drawing

111. Riser should be designed to

(A) ensure directional solidification

(B) maintain proper temperature gradient

(C) maintain a solidification time longer than that of casting

(D) All of the above

112. Which one of the following is an advantage of forging?

(A) Good surface finish

(B) Low tooling cost

(C) Close tolerance

(D) Improved physical property

113. The process carried out on lathe machines for making symmetrical vessel-like objects from sheet metal stock is known as

(A) rolling

(B) turning

(C) spinning

(D) drawing

114. Tubes for shaving cream and toothpaste are made by

(A) forward extrusion

(B) impact extrusion

(C) hydrostatic extrusion

(D) deep drawing

115. Notching is the process in which

(A) blanks are sheared from a metal sheet

(B) burrs are removed from sharp edges

(C) cuts are made at the edge of the stock

(D) cuts are made at the center point of the stock

116. Powder metallurgy process involves which of the following sequences of operations?

(A) Powder mixing, sintering, compacting, finishing

(B) Compacting, powder mixing, sintering, finishing

(C) Powder mixing, sintering, compacting

(D) Powder mixing, compacting, sintering, finishing

117. If no filler metal is used during welding, then the process is termed as

(A) autogenous welding

(B) no-filler welding

(C) filler-free welding

(D) All of the above

118. The welding process that cannot be used for highly electrical conductive materials is

(A) arc welding

(B) gas welding

(C) resistance welding

(D) laser welding

119. Carburizing flame is used to weld materials such as

(A) steel and cast iron

(B) copper alloys

(C) aluminium alloys

(D) All of the above

120. Solder, which is used for joining metal pieces, is an alloy of

(A) tin and lead

(B) tin and zinc

(C) zinc and lead

(D) zinc and copper

121. In brazing, the flux does not

(A) protect the surface from oxidation during joining operation

(B) dissolve oxides from the surface to be joined

(C) reduce surface tension of molten filler metal

(D) reduce the fluidity of the filler metal

122. The ability by which a measuring device can detect small differences in the quantity being measured by it is called its

(A) damping

(B) sensitivity

(C) accuracy

(D) None of the above

123. The designation M 33 × 2 of a bolt means

(A) metric threads of 33 numbers in 2 cm

(B) metric threads with cross-section of 33 mm

(C) metric threads of 33 mm in outside diameter and 2 mm pitch

(D) bolt of 33 mm nominal diameter having 2 threads per cm

124. Which of the following is used to check the diameters of holes?

(A) Plug gauge

(B) Ring gauge

(C) Slip gauge

(D) Standard screw pitch gauge

125. Which of the following instruments is best suited for precise angular measurement?

(A) Vernier caliper

(B) Sine bar

(C) Height gauge

(D) Optical comparator

126. A transition fit is characterized by

(A) always resulting in clearance

(B) always resulting in interference

(C) possibility of either clearance or interference

(D) exact dimensional match without clearance

127. The primary parameter used for quantifying surface roughness is

(A) flatness deviation

(B) roundness error

(C) Ra (arithmetic average roughness)

(D) taper

128. Which of the following is a key advantage of using a coordinate measuring machine (CMM)?

(A) Cannot measure freeform surfaces

(B) Low repeatability

(C) High-speed multi-axis measurement with digital accuracy

(D) Operates only on manual mode

129. The primary purpose of a jig or fixture in manufacturing is to

(A) reduce machine vibration

(B) automate the tool path

(C) accurately locate and hold the workpiece

(D) increase cutting speed

130. What distinguishes a jig from a fixture in manufacturing?

(A) Jigs support the workpiece; fixtures guide the tool

(B) Jigs guide the tool; fixtures only hold the workpiece

(C) Jigs and fixtures are functionally identical

(D) Fixtures are portable; jigs are stationary

131. Which of the following abrasive machining processes is best suited for achieving very fine surface finish and close dimensional accuracy?

(A) Centerless grinding

(B) Honing

(C) Milling

(D) Broaching

132. In grinding wheel specification 'A46K5V', the letter 'K' indicates

(A) grain size

(B) bond type

(C) grade (hardness of the wheel)

(D) abrasive material

133. Which of the following is ***not*** an advantage of CNC machines over conventional machines?

(A) High repeatability

(B) Lower setup cost for large batches

(C) Ability to handle complex geometries

(D) Real-time correction of tool wear

134. In G-code programming, the command G01 represents

(A) rapid positioning

(B) linear interpolation with controlled feed

(C) circular interpolation clockwise

(D) program stop

135. In CNC, absolute programming means

(A) all positions are given relative to the last position

(B) all positions are given relative to the machine home

(C) all positions are given relative to a fixed origin

(D) coordinates are calculated dynamically

136. One of the major benefits of CAD/CAM integration is

(A) elimination of manual quality checks

(B) seamless transition from design to manufacturing

(C) replacing all manual machining

(D) reducing electricity consumption

137. Which of the following is a distinct advantage of additive manufacturing over traditional subtractive methods?

(A) Higher material removal rates

(B) Better dimensional accuracy for all materials

(C) Ability to fabricate complex internal geometries

(D) Faster production of large metal parts

138. In exponential smoothing, the forecast for the next period is calculated using

(A) weighted average of all past observations

(B) moving average of previous 3 periods

(C) previous forecast plus a fraction of forecast error

(D) regression analysis with trend adjustment

139. The mean absolute percentage error (MAPE) is preferred in forecasting because

(A) it measures bias in data

(B) it gives percentage errors, making it scale-independent

(C) it always gives values less than 1

(D) it uses regression coefficients

140. In job-shop scheduling, the objective of Johnson's rule is to

(A) minimize setup time

(B) minimize total inventory

(C) minimize makespan in a two-machine system

(D) maximize machine utilization

141. Which of the following is ***not*** a principle of lean manufacturing?

(A) Eliminating waste

(B) Maximizing work-in-progress inventory

(C) Continuous improvement (Kaizen)

(D) Just-in-time production

142. In the basic EOQ (Economic Order Quantity) model, the total cost (excluding purchase cost) is minimized when

(A) holding cost = ordering cost

(B) holding cost > ordering cost

(C) ordering cost = 0

(D) stockout cost = 0

143. If lead time increases, but all other variables remain the same, which of the following is most likely to increase?

(A) EOQ

(B) Demand rate

(C) Safety stock

(D) Ordering cost

144. A 95% service level implies

(A) there is a 95% chance of stockout

(B) inventory is replenished every 95 days

(C) 95% of customer demand is fulfilled from stock

(D) safety stock equals 95% of total inventory

145. A linear programming problem is said to have multiple optimal solutions when

(A) the feasible region is unbounded

(B) the objective function is parallel to a constraint line

(C) slack variables are zero

(D) there is only one corner point solution

146. In a standard LPP, all constraints are

(A) non-linear

(B) non-negative

(C) linear inequalities or equalities

(D) equations involving absolute values

147. In the simplex method, a basic feasible solution is

(A) a non-degenerate solution

(B) a solution that satisfies all constraints

(C) a solution where all variables are basic

(D) one that maximizes the objective function

148. The transportation problem is a special case of linear programming because

(A) it requires non-linear programming

(B) it includes only supply constraints

(C) it has a special structure for faster algorithms

(D) the objective is always to maximize profit

149. In thermal power plants, the condenser is used to

(A) increase turbine efficiency

(B) convert steam into water

(C) increase temperature

(D) store steam

150. In CPM, the critical path is the path with

(A) minimum number of nodes

(B) least variance

(C) longest duration

(D) lowest cost

ELECTRICAL ENGINEERING

Each question carries **2** marks

51. In a thyristor, the magnitude of anode current will

(A) increase if gate current is increased

(B) increase if gate current is decreased

(C) decrease if gate current is decreased

(D) not change with any variation in gate current

52. In a full-bridge rectifier, how many diodes conduct during each half-cycle of input AC signal?

(A) 1

(B) 2

(C) 3

(D) 4

53. The function of a snubber circuit in a power electronic converter is to

(A) increase efficiency

(B) reduce voltage spikes and ringing

(C) increase switching speed

(D) improve power factor

54. Which of the following is most commonly used in regenerative braking?

(A) Boost converter

(B) Buck converter

(C) Bidirectional DC–DC converter

(D) AC–DC rectifier

55. The main purpose of a freewheeling diode in a converter circuit is to

(A) protect the device from overvoltage

(B) reduce harmonics

(C) increase the power factor

(D) maintain continuous current flow through the inductor

56. Single-line diagram of which of the following power systems is possible?

(A) Power system with LG fault

(B) Balanced power system

(C) Power system with LL fault

(D) Power system with LLG fault

57. If all the sequence voltages at the fault point in a power system are equal, then the fault is

(A) LLG fault

(B) LL fault

(C) LLLG fault

(D) LG fault

58. Which of the following is ***not*** an advantage of hydroelectric power plant?

(A) No fuel requirement

(B) Continuous power source

(C) Low running cost

(D) No standby losses

59. What should be the minimum depth (in m) of cable trench to dug for laying of 1·1 kV?

(A) 0·75

(B) 0·90

(C) 1·05

(D) 1·20

60. Synchronous phase modifiers are installed at which position of the transmission line?

(A) Receiving end

(B) Sending end

(C) Middle of the line

(D) 25% of the line from receiving end

61. In a DC machine, the form of flux density distribution (main field only) waveform is

(A) triangular

(B) sinusoidal

(C) sawtooth

(D) trapezoidal

62. A DIAC is a/an

(A) AC switch

(B) DC switch

(C) mechanical switch

(D) None of the above

63. For series DC generator, internal/ external characteristic starts from

(A) positive non-zero voltage

(B) zero voltage

(C) negative non-zero voltage

(D) Can start from anywhere

64. Load sharing of two generators connected in parallel is determined by

(A) internal characteristics

(B) external characteristics

(C) both internal and external characteristics

(D) None of the above

65. What is the reason behind short circuit in armature?

(A) Insulation failure between two commutator bars

(B) Insulation failure between two turns of a coil

(C) Two or more turns of the same coil getting grounded

(D) Insulation failure between two commutator bars, two turns of a coil or the same coil getting grounded

66. Kirchhoff's laws are ***not*** applicable to circuits with

(A) distributed parameters

(B) lumped parameters

(C) passive elements

(D) non-linear resistances

67. The rated voltage of a 3-phase power system is given as

(A) RMS phase voltage

(B) peak phase voltage

(C) RMS line-to-line voltage

(D) peak line-to-line voltage

68. If a capacitor is energized by a symmetrical square wave current source, then the steady-state voltage across the capacitor will be a/an

(A) square wave

(B) triangular wave

(C) step function

(D) impulse function

69. If the source of 200 V RMS supplies active power of 600 W and reactive power of 800 VAR, then the RMS current drawn from the source is

(A) 10 A

(B) 5 A

(C) 3·75 A

(D) 2·5 A

70. The RMS value of a sine wave is 100 A. Its peak value is

(A) 70·7 A

(B) 139 A

(C) 150 A

(D) 141 A

71. Corona loss can be reduced by the use of hollow conductors because

(A) the current density is reduced

(B) the eddy current in the conductor is eliminated

(C) for a given cross-section, the radius of the conductor is increased

(D) of better ventilation in the conductor

72. In a 70/6 ACSR conductor, there are

(A) 35 aluminium conductors and 3 steel conductors

(B) 70 aluminium conductors and 6 steel conductors

(C) 70 steel conductors and 6 aluminium conductors

(D) None of the above

73. The critical clearing time of a fault in a power system is related to

(A) reactive power limit

(B) short circuit limit

(C) steady-state stability limit

(D) transient stability limit

74. Steady-state stability of a power system is the ability of the power system to

(A) maintain voltage at the rated voltage level

(B) maintain frequency exactly at 50 Hz

(C) maintain a spinning reserve margin at all times

(D) maintain synchronism between machines and on external tie lines

75. Which of the following is the most popular method for measuring low resistance?

(A) Ducter ohmmeter method

(B) Kelvin double bridge method

(C) Ammeter-voltmeter method

(D) Potentiometer method

76. A Schering bridge can be used for

(A) protecting the circuit from temperature rises

(B) testing capacitors

(C) measuring voltages

(D) measuring currents

77. Which of the following determines light intensity in a CRT ?

(A) Current

(B) Fluorescent screen

(C) Voltage

(D) Momentum of electrons

78. The average value of the voltage wave $V = 110 + \sin(314t - 25°)$ V is

(A) 110 V

(B) 200 V

(C) 177 V

(D) 220 V

79. A 2 kVA transformer has iron loss of 150 W and full-load copper loss of 250 W. The maximum efficiency of the transformer would occur when the total loss is

(A) 450 W

(B) 400 W

(C) 250 W

(D) 300 W

80. The equivalent π model is quite suitable for analyzing the performance of the transmission line of

(A) 50 km length

(B) 150 km length

(C) 250 km length

(D) All of the above lengths

81. An overhead line with surge impedance 400 Ω is terminated through a resistance R. A surge travelling over the line does not suffer any reflection at the junction if the value of R is

(A) 20 Ω

(B) 200 Ω

(C) 800 Ω

(D) None of the above

82. The NAND gate output will be low if the two inputs are

(A) 0, 0

(B) 0, 1

(C) 1, 0

(D) 1, 1

83. The number of control lines for an 8-to-1 multiplexer is

(A) 2

(B) 3

(C) 4

(D) 5

84. The 2's complement of the number 1101101 is

(A) 0101110

(B) 0111110

(C) 0110010

(D) 0010011

85. Which of the following memories is volatile memory?

(A) ROM

(B) RAM

(C) PROM

(D) EEPROM

86. In a *J-K* flip-flop, the toggle means

(A) set $Q = 1$ and $Q = 0$

(B) set $Q = 0$ and $Q = 1$

(C) change the output to the opposite state

(D) no change in output

87. Karnaugh map is used for the purpose

(A) of reducing the electronic circuits used

(B) to map the given Boolean logic function

(C) to minimize the terms in a Boolean expression

(D) to maximize the terms of a given Boolean expression

88. The decimal equivalent of binary number 10101 is

(A) 21

(B) 31

(C) 26

(D) 28

89. Which interrupt has the highest priority?

(A) INTR

(B) TRAP

(C) RST 7.5

(D) RST 6.5

90. Which of the following is a one-byte instruction?

(A) MVI B, 05

(B) LDA 2500H

(C) IN 01

(D) MOV A, B

91. PSW stands for the contents of

(A) accumulator

(B) flag register

(C) Both of the above

(D) None of (A) and (B)

92. The depletion region or space charge region or transition region in a semiconductor *P-N* junction diode has

(A) electrons and holes

(B) positive ions and electrons

(C) positive and negative ions

(D) negative ions and holes

93. Of the four characteristics given below, which are the major requirements for an instrumentation amplifier?

P. High common-mode rejection ratio

Q. High input impedance

R. High linearity

S. High output impedance

(A) P, Q and R only

(B) P and R only

(C) P, Q and S only

(D) Q, R and S only

94. Which of the following oscillators is/are suitable for frequencies in the range of megahertz?

(A) *R-C* phase-shift oscillator

(B) Wien bridge oscillator

(C) Hartley oscillator

(D) Both (A) and (C)

95. For a base current of 10 μA, what is the value of collector current in common-emitter configuration, if $\beta_{DC} = 100$?

(A) 10 μA

(B) 100 μA

(C) 10 mA

(D) 1 mA

96. Negative feedback in an amplifier

(A) increases gain

(B) increases noise

(C) reduces bandwidth

(D) reduces gain

97. Which of the following electrical characteristics is ***not*** exhibited by an ideal op-amp?

(A) Infinite voltage gain

(B) Infinite bandwidth

(C) Infinite output resistance

(D) Infinite slew rate

98. Find the output voltage of an ideal op-amp, if V_1 and V_2 are the two input voltages.

(A) $V_o = (V_1 - V_2)$

(B) $V_o = A \times (V_1 - V_2)$

(C) $V_o = A \times (V_1 + V_2)$

(D) $V_o = (V_1 \times V_2)$

99. A thyristor (SCR) is a/an

(A) *P-N-P* device

(B) *N-P-N* device

(C) *P-N-P-N* device

(D) *P-N* device

100. The average gate power dissipation for an SCR is 0·5 W. The voltage applied to the gate is $V_g = 10$ V. What is the maximum value of current I_g for safe operation?

(A) 0·25 A

(B) 10 A

(C) 0·05 A

(D) 0·1 A

101. The forward dv/dt rating of an SCR

(A) increases with increase in the junction temperature

(B) decreases with increase in the junction temperature

(C) increases with decrease in the RMS value of forward anode-cathode voltage

(D) decreases with decrease in the RMS value of forward anode-cathode voltage

102. A step-down chopper is operated at 240 V at a duty cycle of 75%. Find the value of the RMS switch (IGBT/MOSFET) current. Take $R = 10\ \Omega$.

(A) 2·07 A

(B) 200 mA

(C) 1·58 A

(D) 2·4 A

103. Line-commutated inverters have

(A) AC on the supply side and DC on the load side

(B) AC on both supply and load sides

(C) DC on both supply and load sides

(D) DC on the supply side and AC on the load side

104. The output of a single-phase half-bridge inverter on R load is ideally

(A) a sine wave

(B) a square wave

(C) a triangular wave

(D) constant DC

105. The single-phase mid-point type cyclo-converter uses _____ number of SCRs.

(A) 4

(B) 8

(C) 6

(D) None of the above

106. AC voltage controllers convert

(A) fixed AC to fixed DC

(B) variable AC to variable DC

(C) fixed AC to variable AC

(D) variable AC to fixed AC

107. The transient stability limit of a power system can be improved by adding _____ to the system.

(A) series resistance

(B) series capacitor

(C) series inductor

(D) shunt resistance

108. The property of a material that opposes the creation of magnetic flux in it is known as

(A) reluctivity

(B) magnetomotive force

(C) permeance

(D) reluctance

109. Two-wattmeter method is used for the measurement of power in a balanced three-phase load supplied from a balanced three-phase system. If one of the wattmeters reads half of the other (both positive), then the power factor of the load is

(A) 0·532

(B) 0·632

(C) 0·707

(D) 0·866

110. The FM techniques in telemetry are usually employed at

(A) 100 MHz and above with much larger bandwidth than AM

(B) 100 MHz and above with much lesser bandwidth than AM

(C) less than 100 MHz with much larger bandwidth than AM

(D) less than 100 MHz with much lesser bandwidth than AM

111. In radio receiver, output from local oscillator is fed to

(A) RF amplifier

(B) mixer

(C) IF amplifier

(D) detector

112. Which of the following is the result of overmodulation?

(A) Weakening of signal

(B) Distortion

(C) Strengthening of signal

(D) Excessive carrier power

113. Determine the bandwidth occupied by a sinusoidal frequency-modulated carrier for which the modulation index is 2·4.

(A) $4{\cdot}8 f_m$

(B) $6{\cdot}8 f_m$

(C) $2{\cdot}4 f_m$

(D) $3{\cdot}8 f_m$

114. The work done (in μJ) by a charge of 10 μC with a potential 4·386 V is

(A) 32·86

(B) 43·86

(C) 54·68

(D) 65·68

115. In a medium other than air, the electric flux density will be

(A) solenoidal

(B) curl-free

(C) irrotational

(D) divergent

116. Single-line diagram does ***not*** represent

(A) ratings of machines

(B) neutral wire of transmission lines

(C) delta connection of transformer winding

(D) star connection of transformer winding

117. A 50-bus power system Y-bus has 80% sparsity. The total number of transmission lines will be

(A) 225

(B) 563

(C) 345

(D) 456

118. A power system has a maximum load of 15 MW. The annual load factor is 50%. The reserve capacity of the plant is _____ if the plant capacity factor is 40%.

(A) 3·75 MW

(B) 7·75 MW

(C) 6·75 MW

(D) 8·75 MW

119. Which of the following power plants can be profitably employed for supplying base loads as well as peak loads?

(A) Diesel power plant

(B) Hydroelectric power plant

(C) Thermal power plant

(D) Nuclear power plant

120. The effect of short-pitched coil on the generated EMF is

(A) increasing

(B) decreasing

(C) either increasing or decreasing

(D) None of the above

121. The main function of the commutator in a DC machine is to

(A) reduce sparking

(B) reverse the current direction

(C) convert AC to DC

(D) convert electrical energy to mechanical energy

122. A 3-phase induction motor runs at synchronous speed when

(A) slip is 1

(B) torque is 0

(C) slip is 0

(D) load is maximum

123. The armature reaction in a DC generator primarily affects

(A) rotor speed

(B) brush position

(C) terminal voltage

(D) shaft power

124. Which part of a transformer is designed to minimize eddy current losses?

(A) Core made of laminated sheets

(B) Thick copper winding

(C) Oil insulation

(D) Magnetic shielding

125. The torque of an induction motor is maximum when

(A) rotor resistance = rotor reactance

(B) slip is zero

(C) rotor current is zero

(D) supply voltage is maximum

126. Synchronous condensers are used to

(A) supply mechanical power

(B) improve load power factor

(C) increase frequency

(D) step up voltage

127. A synchronous motor is ***not*** self-starting because

(A) no torque is developed at standstill

(B) it runs at very high speed

(C) field current is absent

(D) starting winding is missing

128. A 400 V/100 V, 10 kVA, two-winding transformer is reconnected as an auto-transformer across a suitable voltage source. The maximum rating of such an arrangement could be

(A) 50 kVA

(B) 15 kVA

(C) 12·5 kVA

(D) 8·75 kVA

129. An induction motor having full-load torque of 60 N m when delta connected, develops a starting torque of 120 N m. For the same supply voltage, if the motor is changed to star connection, the starting torque developed will be

(A) 40 N m

(B) 60 N m

(C) 90 N m

(D) 120 N m

130. The synchronous speed for the seventh space harmonic MMF wave of a 3-phase, 8-pole, 50 Hz induction machine is

(A) 107·14 RPM in forward direction

(B) 107·14 RPM in reverse direction

(C) 5250 RPM in forward direction

(D) 5250 RPM in reverse direction

131. The divergence of a magnetic field is always

(A) zero

(B) infinity

(C) equal to electric field

(D) equal to magnetic flux

132. The curl of the electric field is equal to

(A) zero

(B) rate of change of magnetic field

(C) rate of change of electric field

(D) surface integral of magnetic field

133. The intrinsic impedance of free space is approximately

(A) 50 Ω

(B) 100 Ω

(C) 377 Ω

(D) 1000 Ω

134. The Poynting vector represents

(A) magnetic field intensity

(B) electric flux density

(C) energy flow per unit area

(D) magnetic potential

135. The gradient of a scalar field gives

(A) a scalar

(B) a vector pointing in the direction of maximum increase

(C) a unit vector

(D) a constant value

136. The Laplace equation is valid in regions with

(A) zero charge density

(B) infinite charge

(C) uniform current

(D) zero permittivity

137. Displacement current is introduced in Maxwell's equations to account for

(A) static electric fields

(B) conduction in dielectrics

(C) time-varying magnetic fields in capacitors

(D) static magnetic fields

138. Which of the following is ***not*** a source of magnetic field?

(A) Moving charge

(B) Permanent magnet

(C) Changing electric field

(D) Stationary charge

139. A parallel-plate capacitor has an electrode area of $100\,mm^2$, with spacing of 0·1 mm between the electrodes. The dielectric between the plates is air with a permittivity of $8{\cdot}85\times10^{-12}$ F/m. The voltage on the capacitor is 100 V. The stored energy in the capacitor is

(A) 8·85 pJ

(B) 440 pJ

(C) 22·1 nJ

(D) 44·3 nJ

140. The inductance of a long solenoid of length 1000 mm wound uniformly with 3000 turns on a cylindrical paper tube of 60 mm diameter is

(A) 3·2 μH

(B) 3·2 mH

(C) 32 mH

(D) 3·2 H

141. The main objective of load flow analysis is to find

(A) system frequency

(B) load angle

(C) voltage magnitude and phase angle at buses

(D) load current

142. The purpose of a circuit breaker is to

(A) generate electricity

(B) measure current

(C) interrupt fault current

(D) boost voltage

143. A transmission line has resistance (R), inductance (L), conductance (G) and capacitance (C). The line is said to be lossless if

(A) $R = 0$ and $L = 0$

(B) $R = 0$ and $G = 0$

(C) $C = 0$ and $L = 0$

(D) $L = 0$ and $G = 0$

144. The main advantage of HVDC transmission over HVAC is

(A) lower transmission losses over long distances

(B) cheaper cost of installation

(C) better voltage regulation

(D) easier maintenance

145. The reactance of a transmission line is directly proportional to

(A) line length

(B) line voltage

(C) line current

(D) power factor of the load

146. The short-circuit MVA for a power system is calculated based on

(A) the maximum power transmission

(B) the system impedance

(C) the maximum voltage in the system

(D) the rated power of the system

147. In a power system, the function of a governor is to

(A) control the active power generation

(B) maintain system voltage

(C) regulate system frequency

(D) protect generators from overload

148. The transmission line efficiency is defined as the ratio of

(A) power generated to power received

(B) power sent to the transmission line to power received

(C) power received at the load to power generated

(D) power loss to the total power delivered

149. The equivalent impedance of a 220 kV, 50 Hz transmission line is $10 + j50\ \Omega$. The power loss in the transmission line when 100 MW is delivered is approximately

(A) 1 MW

(B) 2 MW

(C) 5 MW

(D) 10 MW

150. A power system consists of three 100 MW generators and a 200 MW load. If one of the generators fails, the load is shared equally between the remaining two generators. The total power output of the system is

(A) 100 MW

(B) 200 MW

(C) 300 MW

(D) 400 MW

COMPUTER ENGINEERING

Each question carries **2** marks

51. Which of the following languages is regular?

(A) $L = \{a^n b^n \mid n \geq 0\}$

(B) $L = \{w \in \{a, b\}^* \mid w$ is a palindrome$\}$

(C) $L = \{w \in \{a, b\}^* \mid$ number of a's = number of b's$\}$

(D) $L = \{w \in \{a, b\}^* \mid w$ does not contain bb as a substring$\}$

52. Which register holds the address of the next instruction to be executed?

(A) Program Counter (PC)

(B) Instruction Register (IR)

(C) Accumulator (AC)

(D) Memory Address Register (MAR)

53. The octal equivalent of the decimal number $(417)_{10}$ is

(A) $(641)_8$

(B) $(619)_8$

(C) $(640)_8$

(D) $(598)_8$

54. In real-time operating system

(A) process scheduling can be done only once

(B) all processes have the same priority

(C) kernel is not required

(D) a task must be serviced by its deadline period

55. Which of the following represents the binary equivalent of the decimal number 15?

(A) 101

(B) 1010

(C) 111

(D) 1111

56. Which among the following grammars is ambiguous?

(A) $S \rightarrow SS \mid a$

(B) $S \rightarrow aSb \mid ab$

(C) $S \rightarrow aS \mid b$

(D) $S \rightarrow \varepsilon$

57. The language $L = \{a^m b^n \mid m = n\}$ is

(A) regular

(B) not context-free

(C) context-free

(D) finite

58. In UNIX, which system call creates the new process?

(A) Create

(B) Fork

(C) New

(D) None of the above

59. The minimum number of states in a DFA accepting the language $L = \{w \in \{0, 1\}^* \mid w \text{ ends with } 0\ 1\}$ is

(A) 2

(B) 3

(C) 4

(D) 5

60. The different ways in which the location of an operand is specified in an instruction are referred to as

(A) access method

(B) addressing mode

(C) memory addressing unit

(D) address bus

61. Which of the following digital logic circuits can be used to add more than 1 bit simultaneously?

(A) Full adder

(B) Ripple-carry adder

(C) Half adder

(D) Serial adder

62. Which data structure is used in a recursive descent parser?

(A) Queue

(B) Stack

(C) Tree

(D) Array

63. How many AND gates are required to construct a 4-bit parallel multiplier if four 4-bit parallel binary adders are given?

(A) Four 2-input AND gates

(B) Eight 2-input AND gates

(C) Sixteen 2-input AND gates

(D) Two 2-input AND gates

64. The result "$X + XY = X$" follows which of the following laws?

(A) Consensus law

(B) Distributive law

(C) Duality law

(D) Absorption law

65. The canonical sum of the product form of the function $y(A, B) = A + B$ is

(A) $AB + BB + A'A$

(B) $AB + AB' + A'B$

(C) $BA + BA' + A'B'$

(D) $AB' + A'B + A'B'$

66. Which of the following grammars can be parsed by an LL(1) parser?

(A) Ambiguous grammar

(B) Left recursive grammar

(C) Predictive grammar

(D) Unrestricted grammar

67. Turnaround time is affected by the

(A) speed of the output device

(B) burst time of the process

(C) scheduling algorithm used

(D) All of the above

68. What is the value of the postfix expression $6324 + - *$?

(A) 74

(B) -18

(C) 22

(D) 40

69. The purpose of syntax-directed translation is to

(A) perform lexical analysis

(B) analyze the syntax tree

(C) translate syntax rules to intermediate code

(D) optimize code

70. Which of the following applications makes use of a circular linked list?

(A) Recursive function calls

(B) Undo operation in a text editor

(C) Implement hash tables

(D) Allocating CPU to resources

71. In a distributed system

(A) exchange of information is done user explicitly

(B) the devices are distributed across the network

(C) the memory is shared

(D) All of the above

72. Which one of the following is the address generated by CPU?

(A) Logical address

(B) Physical address

(C) Absolute address

(D) None of the above

73. What is the result of 2's complement of 1010?

(A) 0110

(B) 1011

(C) 0101

(D) 1110

74. The ability to query data, as well as insert, delete and alter tuples, is offered by

(A) TCL (Transaction Control Language)

(B) DCL (Data Control Language)

(C) DDL (Data Definition Language)

(D) DML (Data Manipulation Language)

75. A directed edge $P_i \rightarrow R_j$ is called

(A) a request edge in resource allocation graph

(B) an allocate edge in a resource allocation graph

(C) a deadlock avoiding edge

(D) None of the above

76. The instruction "ADD R1, R2" is an example of

(A) zero-address instruction

(B) one-address instruction

(C) two-address instruction

(D) three-address instruction

77. Consider a system with five processes *P*0, *P*1, *P*2, *P*3 and *P*4 and three resource types *A*, *B* and *C*. Resource types *A*, *B* and *C* have 10, 5 and 7 instances respectively. Suppose that, at time T_0, the following snapshot of the system has been taken :

Process	*Allocation*			*Maximum need*		
	A	*B*	*C*	*A*	*B*	*C*
*P*0	0	1	0	7	5	3
*P*1	2	0	0	3	2	2
*P*2	3	0	2	9	0	2
*P*3	2	1	1	2	2	2
*P*4	0	0	2	4	3	3

Using Banker's algorithm, determine if this system will encounter a deadlock or not. Which of the following statements is true?

(A) Deadlock will be there.

(B) No deadlock and the save sequence is *P*2 - *P*4 - *P*5 - *P*1 - *P*3.

(C) No deadlock and the save sequence is *P*1 - *P*3 - *P*2 - *P*5 - *P*4.

(D) No deadlock and the save sequence is *P*1 - *P*4 - *P*3 - *P*2 - *P*5.

78. What is the average waiting time in milliseconds (ms) of the following processes using nonpreemptive shortest job first scheduling algorithm?

Process	*Arrival time* (ms)	*Burst time* (ms)
*P*1	0·0	7
*P*2	2·0	4
*P*3	4·0	1
*P*4	5·0	4

(A) 5

(B) 6

(C) 4·5

(D) 4

79. Which of the following is an example of Bluetooth?

(A) Wide area network

(B) Virtual private network

(C) Local area network

(D) Personal area network

80. A system with 32-bit address bus can access up to

(A) 64 KB

(B) 4 GB

(C) 2 GB

(D) 1 MB

81. Consider a schedule S : T1 : R(A), W(B), T2 : R(B), W(A). Which of the following is true for S?

(A) Conflict serializable and view serializable

(B) Not conflict serializable but view serializable

(C) Not view serializable

(D) Conflict serializable but not view serializable

82. Which one of the following is ***not*** a function of network layer?

(A) Congestion control

(B) Error control

(C) Routing

(D) Internetworking

83. The dependency preserving decomposition of schema $R(A, B, C)$ with $FD: A \rightarrow B,\ B \rightarrow C$ is

(A) (A, B), (B, C)

(B) (A, B), (A, C)

(C) (A, B), (A, C), (B, C)

(D) (A, B, C)

84. Which join may cause a significant increase in the number of tuples in the result?

(A) Inner join

(B) Natural join

(C) Cross join

(D) Equi join

85. Which of the following maintains the domain name system?

(A) A single server

(B) A single computer

(C) Distributed database system

(D) None of the above

86. In serializable schedules, two operations conflict if they are by different transactions, operate on the same data item, and at least one of them is

(A) a write

(B) a read

(C) a commit

(D) an abort

87. Which of the following is the network layer protocol for the Internet?

(A) HyperText Transfer Protocol

(B) File Transfer Protocol

(C) Ethernet

(D) Internet Protocol

88. If a link transmits 4000 frames per second and each slot has 8 bits, then what is the transmission rate of the circuit using Time Division Multiplexing (TDM)?

(A) 500 kbps

(B) 32 kbps

(C) 32 bps

(D) 500 bps

89. What type of transmission is involved in communication between a computer and a keyboard?

(A) Half-duplex

(B) Full-duplex

(C) Simplex

(D) Automatic

90. Which of the following is used in an attempt to render a computer resource unavailable to its intended users?

(A) Botnet process

(B) Worm's attack

(C) Virus attack

(D) Denial-of-service attack

91. What is the propagation delay of a 5-stage ripple counter if each flip-flop has a delay of 10 ns?

(A) 10 ns

(B) 50 ns

(C) 20 ns

(D) 5 ns

92. The output of the Boolean function $F = AB + \overline{A}C$ for $A = 1$, $B = 0$, $C = 1$ is

(A) 0

(B) 1

(C) 2

(D) undefined

93. Which sorting algorithm has an average time complexity of $O(n \log n)$?

(A) Bubble sort

(B) Insertion sort

(C) Merge sort

(D) Selection sort

94. In a binary half-adder, the sum output for $A = 1$ and $B = 1$ is

(A) 0

(B) 1

(C) 2

(D) undefined

95. The six task regions of spiral model are

(A) customer communication, planning, risk analysis, engineering, construction & release, customer evaluation

(B) customer communication, planning, coding, engineering, construction & release and customer evaluation

(C) customer communication, planning, risk analysis, engineering, construction, release

(D) customer communication, planning, risk analysis, engineering, construction, support

96. What will be the final value of 'x' in the following C code?

```
# include <stdio.h>
void main ( )
{
    int x = 5 * 9 / 3 + 9;
}
```

(A) 3·75

(B) Depends on compiler

(C) 24

(D) 3

97. Which of the following is the correct sequence of operations in a microprocessor?

(A) Opcode fetch, memory read, memory write, I/O read, I/O write

(B) Opcode fetch, memory write, memory read, I/O read, I/O write

(C) I/O read, opcode fetch, memory read, memory write, I/O write

(D) I/O read, opcode fetch, memory write, memory read, I/O write

98. Auditability is

(A) the ease with which conformance to standards can be checked

(B) the precision of computations and control

(C) Both (A) and (B)

(D) None of the above

99. The output of an XOR gate is 1, when

(A) all inputs are 1

(B) all inputs are 0

(C) inputs are different

(D) inputs are the same

100. Which flip-flop is called a 'toggle flip-flop'?

(A) *S-R* flip-flop

(B) *D* flip-flop

(C) *J-K* flip-flop

(D) *T* flip-flop

101. What is the time complexity of binary search on a sorted array of n elements?

(A) $O(n)$

(B) $O(\log n)$

(C) $O(n \log n)$

(D) $O(1)$

102. The requirement engineering process involves

(A) feasibility study and requirements elicitation

(B) requirements analysis and requirements documentation

(C) requirements validation and requirements management

(D) All of the above

103. Which of the following declarations is ***not*** supported by C language?

(A) string str;

(B) char * str;

(C) float str = 3e2;

(D) Both 'string str;' and 'float str = 3e2;'

104. What is the result of logical or relational expression in C?

(A) True or false

(B) 0 or 1

(C) 0 if an expression is false and any positive number if an expression is true

(D) None of the above

105. What is the recurrence relation for merge sort?

(A) $T(n) = 2T(n/2) + n$

(B) $T(n) = T(n-1) + 1$

(C) $T(n) = 2T(n) + n$

(D) $T(n) = T(n/2) + 1$

106. Which technique is used in Strassen's matrix multiplication algorithm?

(A) Divide and conquer

(B) Greedy

(C) Dynamic programming

(D) Backtracking

107. Which of the following is a system program that integrates a program's individually compiled modules into a form that can be executed?

(A) Interpreter

(B) Assembler

(C) Compiler

(D) Linking loader

108. DELETE (ALGORITHM,5,4) will return

(A) RITH

(B) ORITH

(C) RITHM

(D) ITHM

109. Suppose T contains the text 'HIS FATHER IS THE PROFESSOR'. So INDEX (T, 'THE') is

(A) 0

(B) 7

(C) 15

(D) None of the above

110. What is the time complexity of BFS on a graph with V vertices and E edges?

(A) $O(V^2)$

(B) $O(V+E)$

(C) $O(E \log V)$

(D) $O(\log E)$

111. In heapsort, after deleting the last minimum element, the array will contain elements in

(A) increasing sorting order

(B) tree preorder

(C) tree inorder

(D) decreasing sorting order

112. What is the postfix notation of $(A - B) * (D / E)$?

(A) $ABDE - / *$

(B) $AB - DE / *$

(C) $* - AB / DE$

(D) $AB - DE * /$

113. The number of comparisons to sort a string $S = A\ B\ C\ D\ E$, containing $n = 5$, using quicksort is

(A) 5

(B) 25

(C) 10

(D) 20

114. If E denotes the following algebraic expression

$$[a + (b - c)] * [(d - e) / (f + g - h)]$$

then the preorder traversal of E is

(A) $+ * a - b\ c - / d\ e - + f\ g\ h$

(B) $a\ b\ c - + d\ e - f\ g + h - / *$

(C) $+ * a - b\ c / - d\ e - + f\ g\ h$

(D) $* + a - b\ c / - d\ e - + f\ g\ h$

115. In CSMA/CD, what does a station do when a collision is detected?

(A) Resends immediately

(B) Stops transmitting

(C) Sends jamming signal

(D) Retransmits after timeout

116. The NOR gate output will be high if the two inputs are

(A) 0 and 0

(B) 0 and 1

(C) 1 and 0

(D) 1 and 1

117. If its vertex set V can be partitioned into two nonempty subsets X and Y, such that every edge in E has one endpoint in X and the other endpoint in Y, then such a graph is called

(A) pseudograph

(B) bipartite graph

(C) complete graph

(D) multigraph

118. The adjacent matrix of graph G with n vertices and no parallel edges is a symmetric binary matrix $A(G) = [aij]$ or order $n*n$ where

1. $aij = 1$, if there is an edge between vi and vj
2. $aij = 0$, if vi and vj are not adjacent
3. a self-loop at vertex vi corresponds to $aij = 1$

Select the correct option.

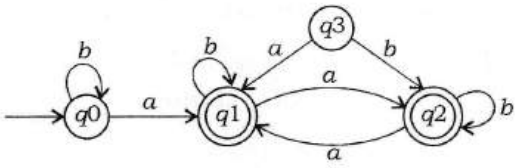
(A) 1 and 2 are correct

(B) 1 and 3 are correct

(C) None is correct

(D) All are correct

119. Consider the finite automata given below :



The language b accepted by this automata is given by the regular expression

(A) $b^* a\, b^* a\, b^* a\, b^*$

(B) $(a + b)^*$

(C) $b^* a(a + b)^*$

(D) $b^* a\, b^* a b^*$

120. If $T1$ and $T2$ are two Turing machines, the composite can be represented using the expression

(A) $T1T2$

(B) $T1 \cup T2$

(C) $T1 \times T2$

(D) None of the above

121. Which data structure is best suited for implementing Undo functionality?

(A) Queue

(B) Stack

(C) Hash table

(D) Linked list

122. Identify the language generated by the following grammar, where S is the start variable :

$$S \rightarrow XY$$
$$X \rightarrow aX \mid a$$
$$Y \rightarrow aY \mid b$$

(A) $\{a^m b^n \mid m >= n,\ n > 0\}$

(B) $\{a^m b^n \mid m >= n,\ n >= 0\}$

(C) $\{a^m b^n \mid m > n,\ n >= 0\}$

(D) $\{a^m b^n \mid m > n,\ n > 0\}$

123. The number of characters that can be represented in ASCII-8 is

(A) 128

(B) 256

(C) 32

(D) 64

124. When implementing two stacks in one array, overflow occurs when

(A) stack 1 becomes full

(B) stack 2 becomes full

(C) stack 1 and stack 2 meet

(D) the array size is even

125. The 8-bit processor means that it has

(A) 8 routes

(B) 8 data lines

(C) 8 address lines

(D) 8 buses

126. A binary tree has 20 nodes with degree 2. How many leaf nodes does it have?

(A) 21

(B) 11

(C) 20

(D) 1

127. What is a set of one or more attribute(s) taken collectively to uniquely identify a record?

(A) Primary key

(B) Foreign key

(C) Superkey

(D) Candidate key

128. Worst-case time complexity of searching in a hash table with open addressing is

(A) $O(1)$

(B) $O(\log n)$

(C) $O(n)$

(D) $O(n \log n)$

129. Which form has a relation that contains information about a single entity?

(A) 4NF

(B) 2NF

(C) 5NF

(D) 3NF

130. COCOMO stands for

(A) constructive cost model

(B) comprehensive cost model

(C) constructive cost estimation model

(D) complete cost estimation model

131. Which model uses a tree structure to represent relationships among data?

(A) Relational model

(B) Network model

(C) Hierarchical model

(D) Object-oriented model

132. A technique of transmitting data or images or videos (information) using a continuous signal is

(A) direct

(B) network

(C) analog

(D) multiple

133. The scheduling algorithm that may cause starvation is

(A) FCFS

(B) SJF

(C) round robin

(D) multilevel queue

134. What is data encryption standard (DES)?

(A) Block cipher

(B) Stream cipher

(C) Bit cipher

(D) Byte cipher

135. Page replacement algorithms are used in

(A) file systems

(B) memory management

(C) CPU scheduling

(D) disk scheduling

136. Which normalization form eliminates transitive dependency?

(A) 1NF

(B) 2NF

(C) 3NF

(D) BCNF

137. What is an example of an SQL function for text manipulation?

(A) CONCAT( )

(B) LENGTH( )

(C) UPPER( )

(D) All of the above

138. Convert $(52)_{16}$ into its decimal equivalent.

(A) $(28)_{10}$

(B) $(83)_{10}$

(C) $(80)_{10}$

(D) $(82)_{10}$

139. Which of the following is the correct output for the given query?

```
(SELECT databaseid
FROM RDBMS
WHERE SECTION ='c')
EXCEPT
(SELECT databaseid
FROM RDBMS
WHERE id<10);
```

(A) All the values of the databaseid for which section is c and id>10

(B) All the values of the databaseid for which section is not c and id>10

(C) All the values of the databaseid for which section is c and id<10

(D) All the values of the databaseid for which section is not c and id<10

140. The wait-for graph is used for

(A) memory management

(B) detecting deadlocks

(C) disk scheduling

(D) file access

141. Which of the following is a valid Hasse diagram for a partially ordered set?

(A) A directed acyclic graph with transitive edges

(B) A graph where each edge represents equality

(C) A complete graph

(D) A binary tree

142. In a Boolean algebra, which of the following is true for any element a?

(A) $a + a = 0$

(B) $a * 1 = 0$

(C) $a + 0 = a$

(D) $a * a' = a$

143. What is the purpose of the SQL keyword 'DISTINCT' in a SELECT statement?

(A) To retrieve unique values from a column

(B) To filter NULL values

(C) To delete duplicate records

(D) To sort the result set

144. What is the main characteristic of symmetric key encryption?

(A) Uses a different key for encryption and decryption

(B) Requires a public directory for key exchange

(C) Uses the same key for both encryption and decryption

(D) Is always slower than asymmetric encryption

145. Which of the following represents a bijective function?

(A) One-to-one but not onto

(B) Onto but not one-to-one

(C) Both one-to-one and onto

(D) Neither one-to-one nor onto

146. In the IPv4 addressing format, the number of networks allowed under class C address is

(A) 2^14

(B) 2^7

(C) 2^21

(D) 2^24

147. If a set has 4 elements, how many subsets does it have?

(A) 8

(B) 16

(C) 12

(D) 24

148. Suppose computers *A* and *B* have IP addresses 10.105.1.113 and 10.105.1.91 respectively and they both use the same netmask *N*. Which of the values of *N* given below should ***not*** be used if *A* and *B* should belong to the same network?

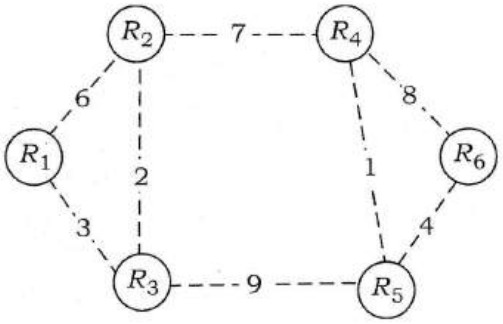
(A) 255.255.255.0

(B) 255.255.255.128

(C) 255.255.255.192

(D) 255.255.255.224

149. Consider a network with 6 routers R_1 to R_6 connected with links having weights as shown in the following diagram :



All the routers use the distance vector-based routing algorithm to update their routing tables. Each router starts with its routing table initialized to contain an entry for each neighbour with the weight of the respective connecting link. After all the routing tables stabilize, how many links in the network will never be used for carrying any data?

(A) 4

(B) 3

(C) 2

(D) 1

150. A firewall protects which of the following attacks?

(A) Phishing

(B) Dumpster diving

(C) Denial-of-service (DoS)

(D) Shoulder surfing