Question Booklet Series: **A**   *Question Booklet Serial No.:* **210283**

PULEET – 2021

Important: *Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.*

Roll No.   *(In Figure)*   *(In Words)*

O.M.R. Answer Sheet Serial No.

Signature of Candidate: _____   *Signature of Invigilator:* _____

Time: 100 Minutes   **Number of Questions: 100**   **Maximum Marks: 100**

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.

INSTRUCTIONS:

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point/Black Gel Pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. Please check that this Question Booklet contains **100** Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
5. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point/Black Gel Pen. There shall be negative marking for wrong answer, ¼ of the marks of the question will be deducted for every wrong answer.**
6. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
7. **30 minutes extra sould be given to the visually handicapped/PwD Candidates.**
8. **Darken** the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
9. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
10. For rough work only the blank sheet at the end of the Question Booklet be used.
11. The University will provide Logarithmic table. Borrowing of log table or other material is not allowed.
12. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
13. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
14. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
15. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistant or found giving or receiving assistant or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
16. **Communication equipment such as mobile phones, pager, wireless set, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
17. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

1. If the difference between the roots of the equation $x^2 - 13x + k = 0$ is 17, then find k.

   (A) 20   (B) -10   (C) -30   (D) 15

2. Find the values of λ and μ for which the system of equations has no solution
   $$x + y + z = 6, \quad x + 2y + 3z = 10, \quad x + 2y + \lambda z = \mu$$
   (A) $\lambda = 3, \mu \neq 10$
   (B) $\lambda = -2, \mu \neq 10$
   (C) $\lambda \neq 3, \mu = 10$
   (D) $\lambda = 1, \mu \neq 10$

3. If A=(-2,1), B=(2,3) and C=(-2,-4) are three points, then find the angle between the straight lines AB and BC.

   (A) 45^0 (B) $\tan^{-1}\left(\frac{1}{3}\right)$

   (C) $\cot^{-1}\left(\frac{2}{3}\right)$ (D) $\tan^{-1}\left(\frac{2}{3}\right)$

4. Find $\frac{\partial w}{\partial x}$ at the point (x,y,z)=(2,-1,1) if $w = x^2 + y^2 + z^2$, $\quad z^3 - xy + yz + y^3 = 1$ and x and y are independent variables.

   (A) -3   (B) 3   (C) 2   (D) 4

5. Find the maximum and minimum values of $f(x,y,z) = x - 2y + 5z$ on the sphere $x^2 + y^2 + z^2 = 30$.

   (A) 30, -30   (B) 40, -20   (C) 35, -30   (D) 20, 10

6. Find the outward flux of the field $F = (y - x)\ \hat{\imath} + (z - y)\ \hat{\jmath} + (y - x)\ \hat{k}$ across the boundary of the region D: The cube bounded by the planes $x = \pm 1$, $y \pm 1$, $z = \pm 1$.
   (A) 10   (B) -16   (C) 16   (D) -10

7. Find the volume of the prism whose base is the triangle in the xy-plane bounded by the x-axis and the lines y=x and x=1 and whose top lies in the plane z=f(x,y)=3-x-y.
   (A) 2   (B) 1   (C) 3   (D) 6

8. Find the curvature of the following curve: $r(\theta) = (a \cos \theta)\ \hat{\imath} + (a \sin \theta)\ \hat{\jmath}$ at any point θ.

   (A) 1   (B) 2   (C) 1/a   (D) π

9. Find the derivative of $f(x,y,z) = x^3 - xy^2 - z$ at $P_0 = (1,1,0)$ in the direction of $A = 2\hat{\imath} - 3\hat{\jmath} + 6\hat{k}$.
   (A) 4/7   (B) 3/7   (C) 2/5   (D) 3/5

10. Find the local extreme values of the function $f(x,y) = xy - x^2 - y^2 - 2x - 2y + 4$.
    (A) Local minima at (-2,-2)   (B) Local maxima at (2,2)
    (C) Saddle point at (2,2)   (D) Local maxima at (-2,-2)

11. The frequency and speed of a wave are 500Hz and 360m/s respectively. If the phase difference between two adjacent particles is 60^0, then distance between them is about:
    (A) 0.7 cm   (B) 12.0 cm   (C) 70.0 cm   (D) 120.0 cm

12. Two Nicol prisms are first crossed and then one of them is rotated through $60°$. The percentage of light transmitted is:
(A) 50.0%   (B) 37.5%   (C) 25.0%   (D) 12.5%

13. The magnetic moment of 1m long steel wire is M. It is bent into a semicircular arc. Its new magnetic moment will be:

(A) M   (B) $\dfrac{M}{2}$ (C) $\dfrac{2M}{\pi}$ (D) $\dfrac{M}{2\pi}$

14. The potential difference V across and current I flowing through the instrument in AC circuit are given by $V = 5\cos\omega t$ volts and $I = 2\sin\omega t$ Amperes. The power dissipated in the instrument is
(A) 2.5W   (B) 5W   (C) 10W   (D) 0W

15. Two bullets P and Q of masses 10g and 40g have velocities of 20m/s and 5m/s respectively. If both strike against a mud wall then:
(A) P will pierce more
(B) Q will pierce more
(C) Both will pierce equally
(D) Nothing can be said

16. In the process of coalescence of small droplets to a big drop, the surface energy of the system:
(A) Increases
(B) Decreases
(C) Remains unchanged
(D) May either increase or decrease.

17. In LCR circuit, the sharpness of the resonance curve:
(A) Decreases with increase of inductance L
(B) Decreases with increase of capacitance C
(C) Doesn't depend upon value of L, C, R
(D) Decreases with increase of resistance R

18. Two Carnot engines A and B are joined in series. A accepts heat at 900K and rejects at T Kelvin while B accepts heat at T Kelvin and rejects at 400K. If the efficiency of engines A and B are same then the value of T will be:
(A) 650K   (B) 600K   (C) 550K   (D) 500K

19. When the $_{88}Ra^{236}$ decays in a series by emission of 3α particles and a β particle. The daughter nucleus formed will be:
(A) $_{83}Bi^{224}$ (B) $_{84}Po^{224}$ (C) $_{85}At^{220}$ (D) $_{87}Fr^{223}$

20. A piece of ice at $0°C$ is added to a vessel containing water at $0°C$, then
(A) All of the ice will melt.
(B) Some ice will melt.
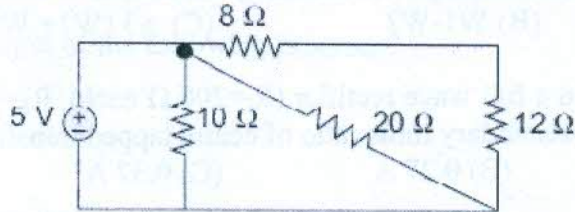(C) No ice will melt.
(D) The temperature will decrease further.

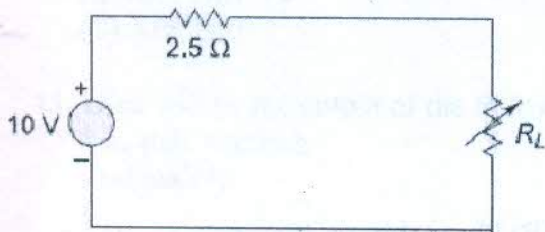21. The Norton Resistance across 10 Ohm resistance is

    (A) 4.8 Ω   (B) $\dfrac{120}{17}\Omega$ (C) 10 Ω   (D) 2.4 Ω
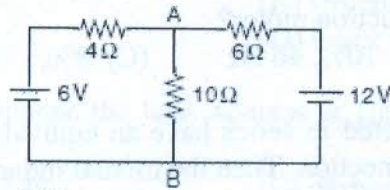
22. Determine the voltage across the 20 ohm resistor of the network shown

    (A) 5 V   (B) 2.5 V   (C) 10 V   (D) 7.5V

23. In the circuit maximum power transferred to the load is

    (A) 5 W   (B) 10 W   (C) 2.5 W   (D) 25 W

24. The impedance of an $R-L$ series circuit is $(50 + j100)$ Ω at 50 Hz. When the supply frequency is 100 Hz, the value of impedance will be
    (A) $(50 + j1000)$ Ω   (B) $(100 + j200)$ Ω
    (C) $(100 + j100)$ Ω   (D) $(50 + j200)$ Ω

25. In the measurement of 3 phase power by two-wattmeter method if the two-wattmeters readings are equal the power factor of the circuit is
    (A) 0.8 lagging   (B) 0.8 leading
    (C) Unity   (D) Zero

26. The direction of rotation of a DC generator can be determined by
    (A) Fleming's right hand rule   (B) Fleming's left hand rule
    (C) Lenz's law   (D) Ampere's law

27. Open-circuit test in transformer is performed at ……….…and gives…………losses.
    (A) Rated transformer voltage, Copper Losses
    (B) Rated transformer Current, Core Losses
    (C) Rated transformer Current, Copper Losses
    (D) Rated transformer voltage, Core Losses

(3)

28. A 3 Phase 50 Hz induction motor has a full load speed of 960 RPM. What is the slip and rotor frequency of the induction motor?
(A) 4%, 2 Hz   (B) 10%, 46 Hz   (C) 8%, 6 Hz   (D) 4%, 48 Hz

29. Two coupled coils connected in series have an equivalent inductance of 16mH or 8mH depending on the interconnection. Then the mutual inductance M between the coils is
(A) 12mH   (B) 8√2 mH.   (C) 4mH.   (D) 2mH.

30. W1 and W2 are readings of two wattmeter's used to measure power of a 3 phase balanced load. The reactive power drawn by the load is
(A) W1+ W2   (B) W1-W2   (C) √3 (W1+ W2)   (D) √3 (W1-W2)

31. DC load current in a full wave rectifier (R_f=200 Ω each), R_L=1 kΩ when fed from 240 V (rms). Primary to secondary turns ratio of centre tapped transformer is 1:3.
(A) 0.17 A   (B) 0.27 A   (C) 0.37 A   (D) 0.47 A

32. I_C in a transistor (β=49), I_{CO}=I_{CBO}=1 μA, I_B=10 μA
(A) 441 μA   (B) 490 μA   (C) 539 μA   (D) 540 μA

33. Emitter follower configuration for BJT resembles with
(A) Source follower configuration for FET
(B) Common drain configuration for FET
(C) Common gate configuration for FET
(D) None of the above

34. Oscillator with best frequency stability is
(A) Crystal oscillator   (B) Phase shift oscillator
(C) Clapp oscillator   (D) Hartley oscillator

35. A op-amp can be used with
(A) ac signal only   (B) dc signal only
(C) both ac and dc signals   (D) neither ac nor dc signals

36. Simplify (A+B)(A+C)
(A) A+BC   (B) A-BC   (C) AC-B   (D) AC+B

37. A four bit modulo 16 ripple counter uses JK flip-flops. If the propagation delay of each flip-flop is 50 ns, maximum clock frequency is
(A) 20 MHz   (B) 10 MHz   (C) 5 MHz   (D) 4 MHz

38. A ballistic galvanometer is used for the measurement of
(A) Voltage   (B) Current   (C) Frequency   (D) Electrical charge

39. A digital voltmeter has a readout range from 0 to 9999 counts. Its full scale reading is 9.999 V. The resolution of the voltmeter is
(A) 1 V   (B) 0.100 V   (C) $\frac{1}{9999}$ V   (D) 1 mV

40. In FM broadcast, the maximum modulation frequency is restricted to
(A) 5 KHz   (B) 10 KHz   (C) 15 KHz   (D) 20 KHz

41. While accessing the structure members, left side of dot operator must be a
   (A) structure variable
   (B) structure pointer
   (C) keyword structure
   (D) index value

42. char A[ ] = "Aniea". Suppose the base address is 1000 then printf("%d", *(A+1)) will display
   (A) n
   (B) an
   (C) garbage value
   (D) ni

43. Which compilation unit is responsible for adding header files content in the source code?
   (A) Linker
   (B) Compiler
   (C) Assembler
   (D) Preprocessor

44. What will be the output of the following program?
```
# include <stdio.h>
# include <conio.h>
void main()
{
char txt[]="ABCDEF\0GHIJKL";
clrscr();
printf ("%s %d",txt,sizeof(txt));  }
```
   (A) ABCDEF 14
   (B) ABCDEF\0GHIJKL 14 L
   (C) ABCDEF 7
   (D) ABCDEF 13

45. What will be the output of the following program?
```
# include <stdio.h>
void main()
{
float x=2.2,sqr(float),y;
y=(int)sqr(x);
printf ("\n x=%g",y);

}
float sqr(float m)
{ return (m*m); }
```
   (A) x=4.50
   (B) x=4
   (C) x=4.84
   (D) x=4.40

46. What will be the output of the following program?
```
#include <stdio.h>
#include <conio.h>
# define product(k) k*k
void main()
{
int k=3,m;
m=product(k++);
clrscr();
printf ("\t k=%d m=%d",k,m);  }
```
   (A) k=4 m=9
   (B) k=4 m=16
   (C) k=5 m=25
   (D) k=5 m=9

(5)

47. Which function gives the current position in the file?
(A) ftell   (B) fseek   (C) putw   (D) getc

48.
```
#include <stdio.h>
int main(int argc, char *argv[]) {
char str1 [ ] = "Cprogram";
int a = 12;
char str2 [15] ;
sprintf (str2, "%s-%d", str1, a) ;
printf ( "%s", str2 ) ;
return 0; }
```
(A) Cprogram12   (B) Cprogram-12
(C) Cprogram 12   (D) Compilation Error

49. Which of the following cannot be accessed by the outside world?
(A) Private members of a class
(B) Public members of a class
(C) Protected members of a class
(D) Both A and C

50. Which of the following is a valid function declaration which returns a pointer?
(A) (double) (example* (double, double));
(B) double (*) example (double, double);
(C) double (example (*double, *double));0
(D) double *example (double, double);

51. During a non-flow thermodynamic process (1-2) executed by a perfect gas, the heat interaction is equal to the work interaction (Q1-2=W1-2) when the process is
(A) Adiabatic   (B) Polytropic   (C) Isothermal   (D) Isentropic

52. A diesel engine is usually more efficient than a spark ignition engine because
(A) Diesel being a heavier hydrocarbon, releases more heat per kg than gasoline
(B) The air standard efficiency of diesel cycle is higher than the Otto cycle, at a fixed compression ratio
(C) The compression ratio of a diesel engine is higher than that of an SI engine
(D) Self ignition temperature of diesel is higher than that of gasoline

53. If a steam sample is nearly in dry condition, then its dryness fraction can be most accurately determined by
(A) Throttling calorimeter
(B) Separating calorimeter
(C) Combined separating & throttling calorimeter
(D) Bucket calorimeter

54. In terms of Poisson's ratio (μ) the ratio of Young's Modulus (E) to Shear Modulus (G) of elastic materials is
(A) $2(1+\mu)$ (B) $2(1-\mu)$ (C) $\frac{1}{2}(1+\mu)$ (D) $\frac{1}{2}(1-\mu)$

(6)

55. For any part of a beam between two concentrated load, Bending moment diagram is a
    (A) Horizontal straight line
    (B) Vertical straight line
    (C) Line inclined to x-axis
    (D) Parabola

56. A siphon draws water from a reservoir and discharges it out at atmospheric pressure. Assuming ideal fluid and the reservoir is large, the velocity at point P in the siphon tube is
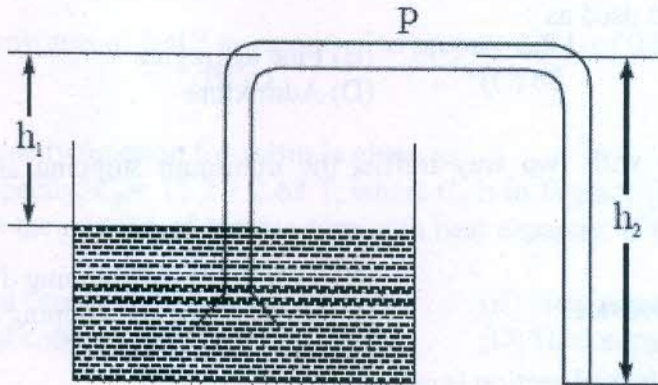
    (A) $\sqrt{2gh_1}$
    (B) $\sqrt{2gh_2}$
    (C) $\sqrt{2g(h_2 - h_1)}$
    (D) $\sqrt{2g(h_2 + h_1)}$

57. Two pipes of uniform section but different diameters carry water at the same volumetric flow rate. Water properties are the same in the two pipes. The Reynolds number, based on the pipe diameter,
    (A) is the same in the both pipes
    (B) depends on the pipe material
    (C) is smaller in the narrower pipe
    (D) is large in the narrow pipe

58. For a completely submerged body with centre of gravity 'G' and centre of buoyancy 'B', the condition of stability will be
    (A) G is located above B
    (B) G is located below B
    (C) G and B are coincident
    (D) independent of the locations of G and B

59. Maximum shear stress developed on the surface of a solid circular shaft under pure torsion is 240 MPa. If the shaft diameter is doubled then the maximum shear stress developed corresponding to the same torque will be
    (A) 120 MPa
    (B) 60 MPa
    (C) 30 MPa
    (D) 15 MPa

60. For a given set of operating pressure limits of Rankine cycle, the highest efficiency occurs for
    (A) Saturated cycle
    (B) Superheated cycle
    (C) Reheat cycle
    (D) Regenerative cycle

61. The lines passing through points at which magnetic declination is equal at a given time are called
    (A) Isogonic lines
    (B) Agonic lines
    (C) Isoclinic lines
    (D) None of the above

62. Argillaceous rocks have their main component as
    (A) Carbonates of lime   (B) Clay or alumina
    (C) Silica or sand   (D) All of these

63. The silica content in the Portland cement should be
    (A) 30 to 55%   (B) 35 to 45%   (C) 15 to 25%   (D) 45 to 60%

64. In lime concrete, lime is used as
    (A) Coarse aggregate   (B) Fine aggregate
    (C) Binding material   (D) Admixture

65. On a single lane road with two way traffic, the minimum stopping sight distance is equal to

    (A) Stopping distance   (B) Two times the stopping distance
    (C) Half the stopping distance   (D) Three times the stopping distance

66. The neutral axis of a balanced section is called as
    (A) Critical neutral axis   (B) Balanced neutral axis
    (C) Equivalent neutral axis   (D) Major neutral axis

67. When ratio of effective length of column to least radius of gyration does not exceed 15, it is called
    (A) Long column   (B) Short column
    (C) Plain column   (D) None of these

68. The minimum size of grains of silts is
    (A) 0.3 mm   (B) 0.01 mm   (C) 0.02 mm   (D) 0.2 mm

69. A land is said to be water logged if
    (A) Air circulation is stopped in the root zone due to rise in water table
    (B) It is submerged in flood
    (C) Soil pores within a depth of 40 cm are saturated
    (D) Soil is eroded

70. The mercury does not wet the glass. This is due to property of fluid known as
    (A) Surface tension   (B) Cohesion   (C) Adhesion   (D) Viscosity

71. 1 bar pressure is equal to
    (A) 101.3kPa   (B) 100 kPa   (C) 1.013kPa   (D) 10 kPa

72. Find out the dimensionless quantity
    (A) Pressure   (B) Reynolds number (C) Viscosity   (D) Density

73. How many g moles of S are there in 22 g of H_2SO_4?
    (A) 0.4489   (B) 0.2245   (C) 0.1256   (D) 0.3256

74. A cylinder contains 8 gm of He, 40 gm of Ne and 80 gm of Ar. (Molecular weights of the components are 4, 20 and 40 respectively). How many moles of He are there in the cylinder?
   (A) 1   (B) 2   (C) 4   (D) 6

75. Specific volume is the inverse of
   (A) Volume   (B) Pressure   (C) Density   (D) Flow rate

76. How many gms of NaCl are required to prepare 2.5 L of 0.6 M solution?
   (A) 22   (B) 44   (C) 66   (D) 88

77. Heat capacity function for sulfur is given as
   Heat capacity, $C_p = 15.2 + 2.68\,T$, where C_p is in J/(gmol)(K) and T is expressed in K. What is the relation of temperature with heat capacity, if C_p is in cal/(gmol)(°F) and T in °F?
   (A) Heat capacity = 29.76 + 0.198T   (B) Heat capacity = 92.76 + 0.198T
   (C) Heat capacity = 192.76 + 1.198T   (D) Heat capacity = 192.76 + 0.198T

78. 15.5 psia equals
   (A) 106.8 kPa   (B) 100.8 kPa   (C) 96.8 kPa   (D) 196.8 kPa

79. For an open-end manometer, if the reference for the open end is pressure of the atmosphere, then the manometer measures
   (A) Absolute pressure   (B) Gauge pressure
   (C) Atmospheric pressure   (D) Vacuum

80. Viscosity has the dimensions
   (A) $ML^{-1}T^{-1}$ (B) $M^{-1}LT$
   (C) $ML^{-1}T^{-3}$ (D) MLT^{-3}

81. The outermost electronic configuration of the most electronegative element is: -
   (A) $ns^2\,np^3$ (B) $ns^2\,np^4$
   (C) $ns^2\,np^5$ (D) $ns^2\,np^6$

82. The correct order of radii is: -
   (A) N < Be < B   (B) $F^- < O^{2-} < N^{3-}$
   (C) Na < Li < K   (D) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

83. Which of the following is correct increasing order of percentage for carbon in coal?
   (A) Peat < Lignite < Anthracite < Bituminous
   (B) Lignite < Anthracite < Peat < Bituminous
   (C) Peat < Lignite < Bituminous < Anthracite
   (D) Peat < Bituminous < Lignite < Anthracite

84. A coal sample contains C=75.5%, H=11.25%, O=11.25, N=1%, S=1%. Calculate gross calorific value?
   (A) 9568 cal/gm   (B) 10000 cal/gm   (C) 9799 cal/gm   (D) 9519 cal/gm

85. What is the formal charge on EDTA reagent when used for analysis of hard water?
    (A) – 2   (B) 0   (C) – 4   (D) – 6

86. Eutrophication of water bodies leading to killing of fishes is mainly due to non-availability of: -
    (A) Food   (B) Light   (C) Essential mineral   (D) Oxygen

87. Which of the following metal can be used as a catalyst in contact process for the synthesis of sulphuric acid?
    (A) CuI   (B) V_2O_5 (C) Ni_2O (D) Mn

88. Which of the following radiations are responsible for green house effect?
    (A) Microwave   (B) Infrared   (C) Visible   (D) Ultraviolet

89. Which of the following metal ion does not contribute to the hardness of water?
    (A) Calcium   (B) Manganese   (C) Sodium   (D) Magnesium

90. Which of the following is not used for semi-permeable membrane?
    (A) Polymethyl sulphate   (B) Cellulose acetate
    (C) Polyamide polymer   (D) Polymethyl acrylate

91. Select the correct word order of the parts of the sentence given below:
    skating   his   never   goes   grandmother
        a   b   c   d   e
    (A) abcde   (B) bcdea   (C) becda   (D) adecb

92. Pick the correct option to complete the sentence given below:
    As the teacher was not _____ with the answers, she _____ the lesson tomorrow.
    (A) Satisfy, repeats   (B) Satisfied, will repeat
    (C) Satisfied, repeated   (D) Satisfying, would repeat

93. May I pay by _____?
    (A) Check   (B) Checked   (C) Chequ   (D) Cheque

94. This is _____ school but the hockey ground is not _____.
    (A) our, ours   (B) yours, yours   (C) our, our   (D) ours, ours

95. She is the _____ girl in the class, no girl is _____ she is.
    (A) taller, tall   (B) tallest, as tall as
    (C) tallest, tall enough   (D) tall, taller as

96. The movie was _____ boring.
    (A) quiet   (B) quietly   (C) quite   (D) quick

97. Is there _____ post office around here? I need to buy _____ stamps.
    (A) a, some   (B) a, an   (C) the, a   (D) an, some

(10)

98. Select the sentence that means the same as the one given here: He usually buys the tickets.
    (A) Sometimes he sells the tickets.
    (B) The tickets are bought by him always.
    (C) He buys the tickets for the team.
    (D) The tickets are usually bought by him.

99. _____ European couple was waiting for _____ show to begin.
    (A) an, the   (B) a, the   (C) the, an   (D) an, an

100. Race: fatigue ::
    (A) fast: taste   (B) fast: food   (C) fast: tongue   (D) fast: hunger

x-x-x