PULEET – 2022

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 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. The mediums of examination shall be English only.
8. **35 minutes extra would be given to the visually handicapped/PwD Candidates.**
9. **Darken** the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
10. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
11. For rough work only the blank sheet at the end of the Question Booklet be used.
12. The University will provide Logarithmic table. Borrowing of log table or other material is not allowed.
13. 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.**
14. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
15. 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.
16. 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.
17. **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.**
18. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

1. Let α, β, γ be the roots of the cubic equation $2x^3 + 3x^2 - x + 4 = 0$. Then find the value of the following expression $\alpha^2 + \beta^2 + \gamma^2 + (\alpha\beta + \beta\gamma + \gamma\alpha)$.
   (A) 7/4
   (B) 11/4
   (C) 5/4
   (D) 4/11

2. What is the number of the solutions of the following system of equations
   $$2x+y=4, \quad x-2y=2, \quad 3x+5y=6$$
   (A) One Solution
   (B) Two solutions
   (C) Infinitely many solutions
   (D) No solution

3. If α, β, γ are angles which a half ray makes with positive directions of axes, then find the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$.
   (A) 0
   (B) 1
   (C) 2
   (D) $\sqrt{2}$

4. The number of vectors of unit length perpendicular to vectors $\vec{A} = \hat{\imath} + \hat{\jmath}$ and $\vec{B} = \hat{\jmath} + \hat{k}$.
   (A) Infinite
   (B) Three
   (C) One
   (D) Two

5. Find the curvature for the curve
   $$\vec{r} = (a\cos t)\,\hat{\imath} + (a\sin t)\,\hat{\jmath} + (bt)\,\hat{k}, \qquad a, b \geq 0, a^2 + b^2 \neq 0.$$
   (A) $\pi(a^2 + b^2)$
   (B) $\frac{a}{a^2+b^2}$
   (C) $\frac{b}{a^2+b^2}$
   (D) $\frac{a-b}{a^2+b^2}$

6. Find the general solution of the differential equation $(x + 2y^3)\frac{dy}{dx} = y$.
   (A) $y = x(y^2 + c)$
   (B) $x = y(y^2 + c)$
   (C) $x = y^3$
   (D) $\frac{x}{y} + y^2 = 1$

7. Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}$, $y=2$, $x=0$ about x-axis.
   (A) 20
   (B) 25
   (C) 16π
   (D) 8π

8. Find the absolute extreme values of the function $f(x,y) = 2 + 2x + 2y - x^2 - y^2$ on the triangular region in the first quadrant bounded by the lines x=0, y=0 and x+y=9.

   (A) Maximum value=4, minimum value= -61
   (B) Maximum value=2, minimum value= -41/2
   (C) Maximum value= -2, minimum value= - 30
   (D) Function has neither a maximum nor a minimum value over the given region

9. Integrate $f(x,y,z) = x - 3y^2 + z$ over the line segment C joining the origin to the point (1,1,1) and find its value.
   (A) 1
   (B) 2
   (C) 0
   (D) −1

10. Find the circulation of the field $\vec{F} = x\,\hat{\imath} + y\,\hat{\jmath}$ of the field around the closed semicircular path that consists of the semicircular arch $\vec{r_1} = (a\cos t)\,\hat{\imath} + (a\sin t)\,\hat{\jmath}, 0 \leq t \leq \pi$, followed by the line segment $\vec{r_2} = a\,\hat{\imath}, -a \leq t \leq a$.
   (A) π
    (B) 0
    (C) $-\pi$
    (D) 2π

11. If K and σ are the thermal and electrical conductivities of a metal at absolute temperature T, then which of the following relations represents Weidmann Franz law:

(A) $\dfrac{K}{\sigma} = cons\tan t$

(B) $\dfrac{K}{\sigma T} = cons\tan t$

(C) $\dfrac{K}{T} = cons\tan t$

(D) $\dfrac{K\sigma}{T} = cons\tan t$

12. As light propagates from one medium to another, which of the following quantities remains invariant:

(A) Frequency of light

(B) Speed of light

(C) Intensity of light

(D) Wavelength of light

13. Which of the following experiments didn't verify wave nature of moving electron

(A) Davison Germer experiment

(B) G P Thomson experiment

(C) Electron motion in orbits of atom

(D) Electron flow in pn junction diode

14. The polarization phenomenon exhibited by light indicates the

(A) Longitudinal nature of light waves

(B) Transverse nature of light waves

(C) Rectilinear propagation property of light

(D) Extremely high speed of light

15. The potential difference V= 97cos(ωt-90) volts is applied across an instrument and current I flowing through it is given by V and I = 43sin(ωt-90) Amperes. The power dissipated in the instrument is

(A) 0W

(B) 10W

(C) 5W

(D) 2.5W

16. In the process of splitting of a big drop into large number of small droplets, the surface energy of the system:

(A) Increases

(B) Decreases

(C) Remains unchanged

(D) May either increase or decrease

17. Which of the following statements is not true:

(A) Young's double slit experiment involves interference of light waves emitted from two real sources.

(B) Lloyd mirror experiment results interference pattern due to light emitted from a real and virtual source.

(C) Fresnel biprism causes interference pattern due to two real sources.

(D) Interference phenomenon obeys the conservation of energy.

18. Two Carnot engines A and B are configured in series. The engine A accepts heat at 1600K temperature and discards heat at T while B absorbs the heat at T while it rejects at a temperature of 900K. If both the engines A and B are equally efficient, then the value of T will be:

(A) 1500K

(B) 1200K

(C) 1000K

(D) 900K

19. If polar ice caps on the earth melt then duration of the day shall

(A) Increase

(B) Decrease

(C) Remains same

(D) Simply can't predict

20. A sample of the $_{88}Ra^{236}$ decays with a half-life of 4 years into daughter nucleus $_{83}Bi^{224}$. The percentage of $_{83}Bi^{224}$ nuclei present in the sample after 16 years will be:
    (A) 80%   (B) 12.5%   (C) 6.25%   (D) 25%

21. According to Fleming's left-hand rule, when the forefinger points in the direction of the field or flux, the middle finger will point in the direction of
    (A) Current in the conductor   (B) Movement of conductor
    (C) Resultant force on conductor   (D) Stator axis

22. The instantaneous values of currents in phases R and Y of a 3-phase system are 25 A each. For a phase sequence of BRY, the instantaneous value of current in phase B is
    (A) 25 A   (B) 50 A   (C) 12.5 A   (D) 43.3 A

23. While measuring power in a three phase load by two-wattmeters method, the readings of two wattmeters will be equal and opposite when
    (A) pf is unity   (B) load is balanced
    (C) phase angle is between 60° and 90°   (D) the load is purely inductive

24. From the two voltages equations $e_1 = E_{max} \sin 100\pi t$, and $e_2 = E_{max} \sin (100\ \pi t + \pi/6)$, it is obvious that
    (A) 1 leads 2 by 30°
    (B) 2 lags behind 1
    (C) 2 achieves its maximum value 1/600 second before 1 does
    (D) 1 achieves its zero value 1/ 600 second before 2

25. The value of resistance R in the circuit given below is
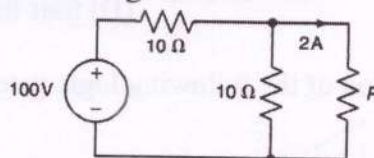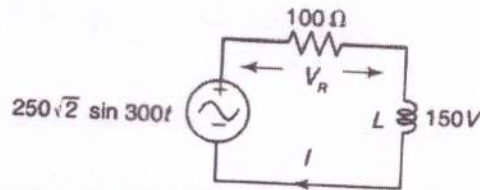

    (A) 10   (B) 20   (C) 30   (D) 40

26. The superposition theorem is applicable to
    (A) current only   (B) voltage only
    (C) both current and voltage   (D) current, voltage and power

27. The Thevenin's equivalent pair (voltage, impedance), as seen at the terminals P–Q, is given by

    (A) 2 V, 5 Ω   (B) 4 V, 5 Ω   (C) 2 V, 7.5 Ω   (D) 4 V, 7.5 Ω
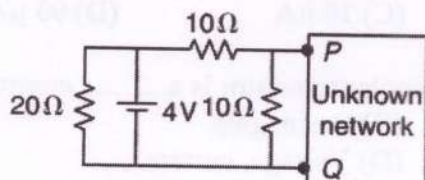
28. Which of the following is true for the circuit given below

    1    $V_R = 100 \sqrt{2}$ V
    2   I = 2 A
    3   L = 0.25 H

Select the correct answer using the codes given below:
(A) 2 and 3   (B) 1 and 2   (C) 1 and 3   (D) 1, 2 and 3

29. At low slip, the torque-slip characteristic is
(A) $T \propto \dfrac{1}{s^2}$ (B) $T \propto s^2$ (C) $T \propto \dfrac{1}{s}$ (D) $T \propto s$

30. Those magnetic materials are best suited for making armature and transformer cores which have _____ permeability and _____ hysteresis loss.
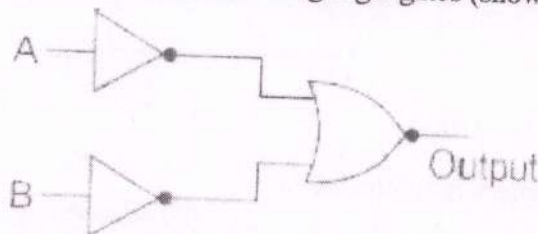(A) low, low   (B) high, low   (C) low, high   (D) high, high

31. A Zener diode has .... breakdown voltage
(A) Zero   (B) Sharp   (C) Undefined   (D) No breakdown

32. The PIV rating of each diode in a bridge rectifier is .... that of the equivalent centre-tap rectifier
(A) one-half   (B) the same as
(C) twice   (D) four times

33. Which logic gate is combination of the following logic gates (shown in fig below)?

(A) AND   (B) OR   (C) NAND   (D) EX-OR

34. The DC base bias voltage of a npn transistor made of Silicon is 10 V and input base resistor is 100 kΩ. What will be the value of base current into the transistor ?
(A) 9.3 µA   (B) 0.93 µA   (C) 10 µA   (D) 93 µA

35. A FET is a...........controlled device whereas a bipolar transistor is a............controlled device.
(A) Current, voltage   (B) Drain, gate
(C) Gate, drain   (D) Voltage, current

36. A circuit whose output is proportional to the difference between the input signals is considered to be which type of amplifier?
(A) Common-mode (B) Darlington   (C) Differential   (D) Operational

(4)

37. In a phase shift oscillator, the frequency determining elements are ....
    (A) L and C   (B) R, L and C   (C) R and C   (D) L only

38. Which of the following is correct for a D latch?
    (A) The output toggles if one of the inputs is held HIGH.
    (B) Q output follows the input D when the enable is HIGH.
    (C) Only one of the inputs can be HIGH at a time.
    (D) The output complement follows the input when enabled.

39. Which of the following represent active transducer?
    (A) Thermocouple   (B) Strain gauge   (C) Thermistor   (D) LVDT

40. A carrier of peak voltage 15 V is used to transmit a message signal. If the modulation index
    is 70%, then what will be the peak voltage of the modulating signal?
    (A) 25 V   (B) 11 V   (C) 10.5 V   (D) 30.5 V

41. What will be the output of following program?
    ```
    int main() {
        int i=065,j=65;
        printf("%d %d",i,j);
        return 0;
    }
    ```

    (A) 53 65   (B) 65 65   (C) 065 65   (D) Syntax error

42. Assuming int is of 4 bytes, what is the size of int arr[15][2][10];?
    (A) 300   (B) 600   (C) 1200   (D) 27

43. What is the output of below program:-
    ```
    int main()
    {
    int i, j, count;
    count= 0;
    for(i=0; i<5; i++);
    {
            for(j=0;j<5;j++);
            {
                count++;
            }
    }
    printf("%d",count);
    return 0;
    }
    ```
    (A) 25   (B) 5   (C) 1   (D) 0

44. The concept of having two functions with same signatures in base and derived class is known
    as?
    (A) Operator Overloading   (B) Function Overloading
    (C) Function Overriding   (D) Function renaming

(5)

45. What will be the output of following program?
```
# include <stdio.h>
int main( )
{
    char s1[7] = "1234", *p;
    p = s1 + 2;
    *p = '0' ;
    printf ("%s", s1);
}
```
(A) 12   (B) 12400   (C) 1204   (D) 1034

46. The keyword used to transfer control from a function back to the calling function is
(A) switch   (B) goto   (C) exit   (D) return

47. Which operator connects a STRUCTURE POINTER VARIABLE to STRUCTURE MEMBER NAME?
(A) --
(C) .
(B) ->
(D) Both -> and . can be used interchangeably

48. Which file is generated after pre-processing of a C program?
(A) .p   (B) .i   (C) .o   (D) .m

49. What do various characters in 'ab+' stand for in the following operation?
```
FILE *fp;
fp = fopen("Random.txt", "ab+");
```
(A) a=Append, b=binary, + = update
(C) a=Append, b=binary, +=write-only
(B) a=Add, b=binary, +=update
(D) a=Assign, b=binary,+=Addition

50. The following statement in 'C'
int (*f())[ ];   declares
(A) a function returning a pointer to an array of integers.
(B) a function returning an array of pointers to integers.
(C) array of functions returning pointers to integers.
(D) an illegal statement.

51. The correct sequence of the processes taking place in a Carnot cycle is
(A) adiabatic -> adiabatic -> isothermal -> isothermal
(B) adiabatic -> isothermal -> adiabatic -> isothermal
(C) isothermal -> isothermal -> adiabatic -> adiabatic
(D) isothermal -> adiabatic -> isothermal -> adiabatic

52. When a liquid and its vapour are in equilibrium at a certain pressure and temperature, then which of the following is required to identify the saturation state.
(A) pressure
(C) both pressure and temperature
(B) temperature
(D) pressure or temperature

53. The compression ratio is given by
(A) Vmax / total volume
(C) V(at TDC) / V(at BDC)
(B) Vmin / Vmax
(D) V(at BDC) / V(at TDC)

(6)

54. γ (gamma) for air is equal to
    (A) 1.0   (B) 1.4   (C) 1.3   (D) 1.2

55. When a fluid is subjected to resistance, it undergoes a volumetric change due to ___

    (A) Cohesion   (B) Strain   (C) Compressibility   (D) Adhesion

56. Consider a tank of height 20m filled with liquid of density 100kg/m³. The area of tank is 10m². If the tank has a hole of area 2m² at the bottom, find the speed of the liquid flowing out through the hole when the height of liquid in the tank is 10m. Assume speed of liquid descending at top of tank is 5m/s.
    (A) 20m/s   (B) 14.14m/s   (C) 15m/s   (D) 20.615m/s

57. If all particle of fluid has a path parallel to the wall, it is known as _____
    (A) Stream line flow   (B) Laminar flow
    (C) Viscous flow   (D) All of the mentioned

58. What is the maximum bending moment for simply supported beam carrying a point load "W" kN at its centre?
   (A) W kNm   (B) W/m kNm   (C) W×l kNm   (D) W×l/4 kNm

59. Where do the maximum BM occurs for the below diagram.
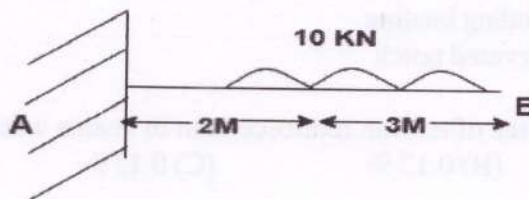
    (A) -54 kNm   (B) -92 kNm   (C) -105 kNm   (D) – 65 kNm

60. What are the units of torsional rigidity?
    (A) Nmm²   (B) N/mm   (C) N-mm   (D) N

61. Excavation is to be made for a reservoir measuring 20 m long, 12 m wide at the bottom, and 2 m deep. The side slopes are to be 1:1 and the top to the flush with the ground which is level in the vicinity. As per the prismoidal formula, the volume of excavation will be
    (A) 610.33 m³   (B) 618.66 m³   (C) 625.00 m   (D) 633.66 m³

62. The condition satisfies steady- Non-uniform flows are (t represents time and s represents space)
    (A) $\frac{df}{dt} \neq 0, \frac{df}{ds} \neq 0$ (B) $\frac{df}{dt} = 0, \frac{df}{ds} = 0$ (C) $\frac{df}{dt} = 0, \frac{df}{ds} \neq 0$ (D) $\frac{df}{dt} \neq 0, \frac{df}{ds} = 0$

63. A compacted soil sample using 10% moisture content has a weight of 200 g and a mass unit weight of 2.0 g/cm³. If the specific gravity of soil particles and water are 2.7 and 1.0, the degree of saturation of the soil is
    (A) 11.1%   (B) 55.6%   (C) 69.6%   (D) None of these

64. U_1 and U_2 are the strain energies stored in a prismatic bar due to axial tensile forces P_1 and P_2, respectively. The strain energy U stored in the same bar due to the combined action of P_1 and P_2 will be

(A) $U = U_1 + U_2$ (B) $U < U_1 + U_2$ (C) $U = U_1 U_2$ (D) $U > U_1 + U_2$

65. The total length of a valley formed by two gradients - 3% and + 2% curve between the two tangent points to provide a rate of change of centrifugal acceleration of 0.6 m/sec², a design speed of 100 kmph, is

(A) 80 m   (B) 60 m   (C) 84.6 m   (D) 82 m

66. Ultimate strength to cement is provided by

(A) Tricalcium silicate
(C) Tri-calcium aluminate
(B) Di-calcium silicate
(D) Tetra calcium alumino ferrite

67. Which of the following is added to steel to increase resistance to corrosion?

(A) Copper   (B) Carbon   (C) Manganese   (D) Sulphur

68. Which of the following canal acts as an irrigation canal as well as a feeder canal?

(A) Carrier canal
(C) Permanent canal
(B) Feeder canal
(D) Inundation canal

69. The plinth area of a building does not include

(A) Area of the walls at the floor level
(B) Internal shaft for sanitary installations up to 2 sq m. in area
(C) Lift and wall including landing
(D) Area of the cantilevered porch

70. What is the minimum area of tension reinforcement in beams when Fe 415 is used?

(A) 0.8 %   (B) 0.12 %   (C) 0.15%   (D) 0.2 %

71. Calculate the number of moles in 42 grams of $NaHCO_3$?

(A) 0.5   (B) 1   (C) 1.5   (D) 2

72. What is the density of a substance of mass 10 grams and volume 5 liters?

(A) 2 kg/m³   (B) 20 kg/m³   (C) 200 kg/m³   (D) 2000 kg/m³

73. A Composition of carbon dioxide, oxygen and nitrogen with mole ratio 1:2:5 with 4 moles of oxygen, enters a reactor with a flow rate of 100 kg/s, the ratio of rates of leaving the reactor of the three is 5:2:1, and 5 moles of nitrogen leaves the reactor, what is the total number of moles leaving the reactor?

(A) 6.1   (B) 6.2   (C) 6.3   (D) 6.4

74. How many recycle streams are there in the following process?
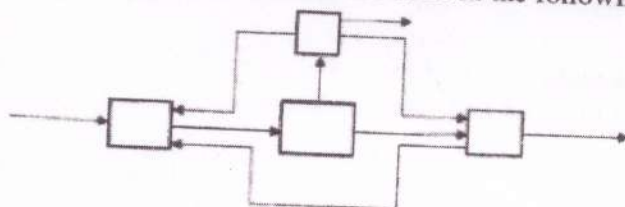
(A) 1   (B) 2   (C) 3   (D) 4

75. N_2 with pressure 10 atm and H_2 with pressure 30 atm, both with volume 10 liter at 27 °C are passed into a reactor, how many moles NH_3 is produced?
   (A) 4   (B) 8   (C) 12   (D) 16

76. What is the pressure if 10 N of force acts at 60 degrees from the normal of a 5 m^2 surface?
   (A) 0.5 Pa   (B) 1 Pa   (C) 2 Pa   (D) 4 Pa

77. Which of the following is greatest?
   (A) 10^oC (B) 10^oR (C) 10^oF (D) 10 K

78. What is the partial pressure of 20% gas in a system with vapor pressure 10 mm Hg?
   (A) 2 mm Hg   (B) 10 mm Hg   (C) 50 mm Hg   (D) 100 mm Hg

79. What is the specific humidity, if the mass of water is 15 g and mass of bone dry air is 25 g?
   (A) 10%   (B) 30%   (C) 40%   (D) 60%

80. What is the molecular weight of a mixture that contains 25% CO_2, 40% O_2 and 35% N_2?
   (A) 11.2 g   (B) 22.4 g   (C) 33.6 g   (D) 44.8 g

81. Coking time in beehive coke oven is about
   (A) 12 hours   (B) 2-3 days   (C) One week   (D) Two weeks

82. Gross calorific value of a fuel containing C = 84%, S = 1.5 %, H = 5.5% O = 8.4 % and the rest of the incombustible matter is
   (A) 4850 kcal/kg   (B) 2785 kcal/kg   (C) 8356 kcal/kg   (D) 6500 kcal/kg

83. Waterline corrosion in steel tank is an example of
   (A) differential aeration corrosion   (B) pitting corrosion
   (C) differential metal corrosion   (D) stress corrosion

84. Out of following metals, which is more corrosion resistant than expected from their position in the electrochemical series?
   (A) Mg   (B) Co   (C) Al   (D) Fe

85. What is the value of hardness in terms of $CaCO_3$ equivalents if a water sample contains 408 mg of $CaSO_4$ per litre?
   (A) 350   (B) 250   (C) 200   (D) 300

86. Total hardness in water sample is determined by
   (A) acid-base titration   (B) precipitation titration
   (C) complexometric titration   (D) redox titration

87. The quantum number that determines the shape of the subshell is
   (A) magnetic quantum number   (B) principal quantum number
   (C) spin quantum number   (D azimuthal quantum number

88. Energy of electron in the third orbit of hydrogen atom is
   (A) -1311.8 kj/mol   (B) -109.0 kj/mol   (C) -229.5 kj/mol   (D) -145.7 kj/mol

89. Out of following green house gases, identify the one which is not naturally occurring?
   (A) CO_2 (B) CFCs   (C) N_2O (D) CH_4

90. Thickness of the ozone layer is generally measured in unit of
   (A) Dobson   (B) Debye   (C) ppm   (D) milligram

91. Select the option that correctly completes this sentence: We informed all the _____.
   (A) son in laws   (B) sons in law   (C) sons in laws   (D) son in law

92. Select the option that correctly completes this sentence: Since it was _____ the match was _____.
   (A) rained, postpone
   (C) raining, postponing
   (B) rain, postponed
   (D) raining, postponed

93. Select the option that correctly completes this sentence: A _____ in time _____ nine.
   (A) stitch, saves   (B) step, gets   (C) stitch, earns   (D) step, saves

94. Choose the correct sentence from the options given below.
   (A) They have been living here from a long time.
   (B) They have been living here in a long time.
   (C) They have been living here for a long time
   (D) They have been living here with a long time.

95. Pick out the group of words that is made up of verbs from the options below.
   (A) opinion, walk, read & sit
   (C) obstacle, eat, hold & write
   (B) edit, speak, jump & squat
   (D) limp, lamp, dribble & sit

96. Pick out the correct sentence from the options given below.
   (A) He did many mistakes.
   (C) He do many mistakes.
   (B) He wrote many mistakes.
   (D) He made many mistakes.

97. Pick out the correct sentence from the options given below.
   (A) I have been studying Law since 2020.
   (C) I had been studied Law since 2020.
   (B) I am studying Law since 2020.
   (D) I am study Law since 2020.

98. Which word does NOT belong with the other words?
   (A) Blade   (B) Decide   (C) Vase   (D) Table

99. Pick out the word that does NOT belong with the other words.
   (A) Scent   (B) Fragrance   (C) Odour   (D) Perfume

100. Choose the option with the correct sentence.
   (A) The children were not playing in the ground that day.
   (B) The children that day in the ground were not playing.
   (C) The children are not played in the ground that day.
   (D) The children were not play in the ground that day.

x-x-x

(10)