SUBJECT : PHYSICS	DAY – 2
SESSION : MORNING	TIME : 10.30 A.M. TO 11.50 A.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A - 1	472657

DOs :
1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2ⁿᵈ Bell i.e., after 10.30 a.m.
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS :
1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. **The 3ʳᵈ Bell rings at 10.40 a.m., till then;**
   - Do not remove the paper seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the 3ʳᵈ Bell is rung at 10.40 a.m., remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

   Correct Method of shading the circle on the OMR answer sheet is as shown below :

   ① ● ③ ④

4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 11.50 a.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

P   [Turn Over

1. Which one of the following is NOT correct ?

    (1) Dimensional formula of thermal conductivity (K) is $M^1L^1T^{-3}K^{-1}$

    (2) Dimensional formula of potential (V) is $M^1L^2T^3A^{-1}$

    (3) Dimensional formula of permeability of free space (μ_0) is $M^1L^1T^{-2}A^{-2}$

    (4) Dimensional formula of RC is $M^0L^0T^{-1}$

2. In a lift moving up with an acceleration of 5 ms^{-2}, a ball is dropped from a height of 1.25 m. The time taken by the ball to reach the floor of the lift is ...... (nearly) ($g = 10\ ms^{-2}$)

    (1) 0.3 second   (2) 0.2 second

    (3) 0.16 second   (4) 0.4 second

3. A gun fires a small bullet with kinetic energy K. Then kinetic energy of the gun while recoiling is

    (1) K   (2) more than K

    (3) less than K   (4) $\sqrt{K}$

4. From a fixed support, two small identical spheres are suspended by means of strings of length 1 m each. They are pulled aside as shown and then released. B is the mean position. Then the two spheres collide,
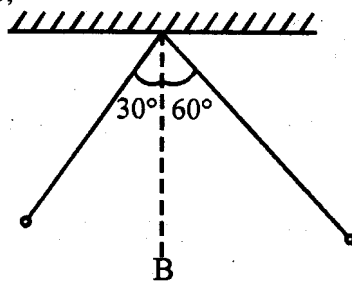
    (1) at B after 0.25 second
    (2) at B after 0.5 second
    (3) on the right side of B after some time
    (4) on the right side of B when the strings are inclined at 15° with B

Space For Rough Work

5. A truck accelerates from speed v to 2v. Work done in during this is

    (1)   three times as the work done in accelerating it from rest to v.

    (2)   same as the work done in accelerating it from rest to v.

    (3)   four times as the work done in accelerating it from rest to v.

    (4)   less than the work done in accelerating it from rest to v.

6. Earth is moving around the Sun in elliptical orbit as shown. The ratio of OB and OA is R. Then the ratio of Earth at A and B is
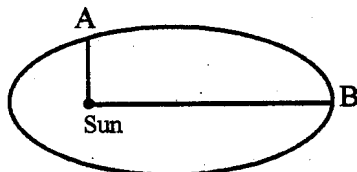
    (1) R^{-1} (2) $\sqrt{R}$

    (3) R (4) $R^{2/3}$

7. A projectile is projected at 10 ms^{-1} by making at an angle 60° to the horizontal. After some time its velocity makes an angle of 30° to the horizontal. Its speed at this instant is

    (1) $\dfrac{10}{\sqrt{3}}$ (2) $10\sqrt{3}$

    (3) $\dfrac{5}{\sqrt{3}}$ (4) $5\sqrt{3}$

8. For which combination of working temperatures of source and sink, the efficiency of Carnot's heat engine is maximum ?

    (1) 600 K, 400 K   (2) 400 K, 200 K

    (3) 500 K, 300 K   (4) 300 K, 100 K

Space For Rough Work

9. A solid cylinder of radius R made of a material of thermal conductivity K_1 is surrounded by a cylindrical shell of inner radius R and outer radius 2R made of a material of thermal conductivity K_2. The two ends of the combined system are maintained at two different temperatures. Then there is no loss of heat across the cylindrical surface and the system is in steady state. The effective thermal conductivity of the system is

    (1) $K_1 + K_2$ (2) $\dfrac{K_1 K_2}{K_1 + K_2}$

    (3) $\dfrac{3K_1 + K_2}{4}$ (4) $\dfrac{K_1 + 3K_2}{4}$

10. Two stars A and B radiate maximum energy at the wavelengths of 360 nm and 480 nm respectively. Then the ratio of the surface temperatures of A and B is

    (1)   3 : 4   (2)   81 : 256
    (3)   4 : 3   (4)   256 : 81

11. Two solids P and Q float in water. It is observed that P floats with half of its volume immersed and Q floats with $\dfrac{2}{3}^{rd}$ of its volume is immersed. The ratio of densities of P and Q is

    (1)   4/3   (2)   3/4
    (3)   2/3   (4)   3/2

12. The equation of a transverse wave is given by $y = 0.05 \sin \pi(2t - 0.02x)$, where x, y are in metre and t is in second. The minimum distance of separation between two particles which are in phase and the wave velocity are respectively _____

    (1)   50 m, 50 ms^{-1} (2)   100 m, 100 ms^{-1}
    (3)   50 m, 100 ms^{-1} (4)   100 m, 50 ms^{-1}

13. The frequency of the second overtone of the open pipe is equal to the frequency of the first overtone of the closed pipe. The ratio of the lengths of the open pipe and the closed pipe is

    (1)   2 : 1   (2)   1 : 2
   (3)   1 : 3   (4)   3 : 1

Space For Rough Work

14. A person with vibrating tuning fork of frequency 338 Hz is moving towards a vertical wall with a speed of 2 ms^{-1}. Velocity of sound in air is 340 ms^{-1}. The number of beats heard by that person per second is

    (1) 2   (2) 4

    (3) 6   (4) 8

15. Pick out the WRONG statement from the following :

    (1)   Lateral shift increases as the angle of incidence increases.

    (2)   Lateral shift increases as the value of refractive index increases.

    (3)   Normal shift decreases as the value of refractive index increases.

    (4)   Both normal shift and lateral shift are directly proportional to the thickness of the medium.

16. The refraction through the prisms are as shown. Pick out the WRONG statement from the following. Path of the light ray in

    (a)   (b)   (c)   (d)
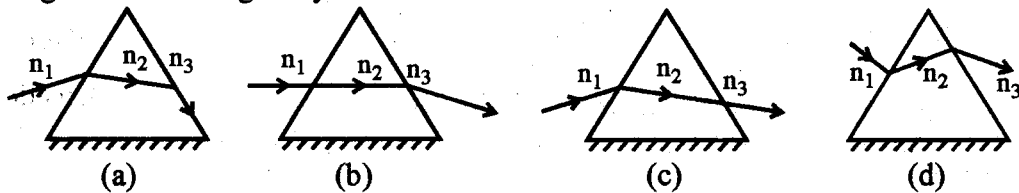
    (1)   a is correct if $n_2 > n_1$ and $n_2 > n_3$

    (2)   b is correct if $n_1 = n_2$ and $n_2 > n_3$

    (3)   c is correct if $n_2 < n_1$ and $n_2 = n_3$

    (4)   d is correct if $n_1 > n_2$ and $n_2 < n_3$

17. The distance between an object and its real image produced by a converging lens is 0.72 m. The magnification is 2. What will be the magnification when the object is moved by 0.04 m towards the lens ?

    (1) 2   (2) 4

    (3) 3   (4) 6

Space For Rough Work

18. The speed of light in media M_1 and M_2 are 1.5×10^8 ms^{-1} and 2×10^8 ms^{-1} respectively. A ray travels from medium M_1 to the medium M_2 with an angle of incidence θ. The ray suffers total internal reflection. Then the value of the angle of incidence θ is

   (1) $> \sin^{-1}\left(\dfrac{3}{4}\right)$ 　　　　　　(2) $< \sin^{-1}\left(\dfrac{3}{4}\right)$

   (3) $= \sin^{-1}\left(\dfrac{4}{3}\right)$ 　　　　　　(4) $\leq \sin^{-1}\left(\dfrac{3}{4}\right)$

19. Which of the following phenomena support the wave theory of light ?
    (a) scattering
    (b) interference
    (c) diffraction
    (d) velocity of light in a denser medium is less than the velocity of light in the rarer medium

    (1) a, b, c 　　　　　　(2) a, b, d
    (3) b, c, d 　　　　　　(4) a, c, d

20. White light reflected from a soap film (Refractive Index = 1.5) has a maxima at 600 nm and a minima at 450 nm with no minimum in between. Then the thickness of the film is
    _____ $\times 10^{-7}$ m.

    (1) 1 　　　　　　(2) 2
    (3) 3 　　　　　　(4) 4

21. A cylindrical tube of length 0.2 m and radius R with sugar solution of concentration 'C' produce a rotation of θ in the plane of vibration of a plane polarized light. The same sugar solution is transferred to another tube of length 0.3 m of same radius. The remaining gap is filled by distilled water. Now the optical rotation produced is

    (1) θ 　　　　　　(2) $2\dfrac{\theta}{3}$

    (3) $3\dfrac{\theta}{2}$ 　　　　　　(4) $9\dfrac{\theta}{4}$

Space For Rough Work

22. Radii of curvature of a converging lens are in the ratio 1 : 2. Its focal length is 6 cm and refractive index is 1.5. Then its radii of curvature are _____ respectively.

    (1) 9 cm and 18 cm   (2) 6 cm and 12 cm

    (3) 3 cm and 6 cm   (4) 4.5 cm and 9 cm

23. A small oil drop of mass 10^{-6} kg is hanging in at rest between two plates separated by 1 mm having a potential difference of 500 V. The charge on the drop is _____ ($g = 10$ ms^{-2})

    (1) 2×10^{-9} C   (2) 2×10^{-11} C

    (3) 2×10^{-6} C   (4) 2×10^{-8} C

24. A uniform electric field in the plane of the paper as shown. Here A, B, C, D are the points on the circle. V_1, V_2, V_3, V_4 are the potentials at those points respectively. Then
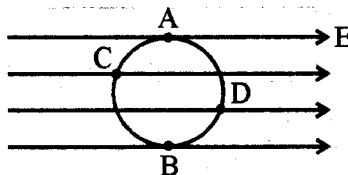
    (1) $V_A = V_C$, $V_B = V_D$ (2) $V_A = V_C$, $V_B > V_D$

    (3) $V_A > V_C$, $V_B > V_D$ (4) $V_A = V_B$, $V_C = V_D$

25. Two metal spheres of radii 0.01 m and 0.02 m are given a charge of 15 mC and 45 mC respectively. They are then connected by a wire. The final charge on the first sphere is _____ $\times 10^{-3}$ C.

    (1) 40   (2) 30

    (3) 20   (4) 10

26. Two concentric spheres of radii R and r have positive charges q_1 and q_2 with equal surface charge densities. What is the electric potential at their common centre ?

    (1) $\dfrac{\sigma}{\epsilon_0}(R + r)$ (2) $\dfrac{\sigma}{\epsilon_0}(R - r)$

    (3) $\dfrac{\sigma}{\epsilon_0}\left(\dfrac{1}{R} + \dfrac{1}{r}\right)$ (4) $\dfrac{\sigma}{\epsilon_0}\left(\dfrac{R}{r}\right)$

Space For Rough Work

27. When an additional charge of 2C is given to a capacitor, energy stored in it is increased by 21%. The original charge of the capacitor is
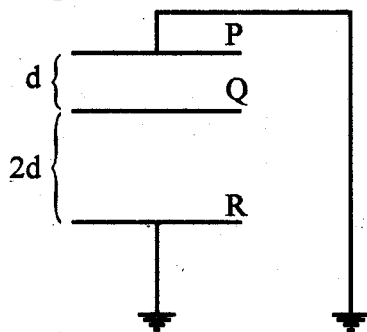
   (1) 30 C   (2) 40 C

   (3) 10 C   (4) 20 C

28. When a potential difference of 10^3 V is applied between A and B, a charge of 0.75 mC is stored in the system of capacitors as shown. The value of C is (in μF)

   (1) ½   (2) 2

   (3) 2.5   (4) 3

29. See the diagram. Area of each plate is 2.0 m² and $d = 2 \times 10^{-3}$ m. A charge of 8.85×10^{-8} C is given to Q. Then the potential of Q becomes

   (1) 13 V   (2) 10 V

   (3) 6.67 V   (4) 8.825 V

Space For Rough Work

30. Three conductors draw currents of 1 A, 2 A and 3 A respectively, when connected in turn across a battery. If they are connected in series and the combination is connected across the same battery, the current drawn will be

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

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

(3) $\frac{4}{7}$ A

(4) $\frac{5}{7}$ A

31. In the circuit, $R_1 = R_2$. The value of E and R_1 are _____ (E – EMF, R_1 – resistance)

(1) 180 V, 60 Ω

(2) 120 V, 60 Ω

(3) 180 V, 10 Ω

(4) 120 V, 10 Ω

32. Masses of three wires of copper are in the ratio of 1 : 3 : 5 and their lengths are in the ratio of 5 : 3 : 1. The ratio of their electrical resistances is

(1) 1 : 3 : 5

(2) 5 : 3 : 1

(3) 1 : 15 : 125

(4) 125 : 15 : 1

33. For a transformer, the turns ratio is 3 and its efficiency is 0.75. The current flowing in the primary coil is 2 A and the voltage applied to it is 100 V. Then the voltage and the current flowing in the secondary coil are _____ respectively.

(1) 150 V, 1.5 A

(2) 300 V, 0.5 A

(3) 300 V, 1.5 A

(4) 150 V, 0.5 A

Space For Rough Work

34. A proton and helium nucleus are shot into a magnetic field at right angles to the field with same kinetic energy. Then the ratio of their radii is

    (1) 1 : 1   (2) 1 : 2

    (3) 2 : 1   (4) 1 : 4

35. Two identical circular coils A and B are kept on a horizontal tube side by side without touching each other. If the current in the coil A increases with time, in response, the coil B

    (1) is attracted by A   (2) remains stationary

    (3) is repelled   (4) rotates

36. In the diagram, I_1, I_2 are the strength of the currents in the loop and straight conductors respectively. OA = AB = R. The net magnetic field at the centre O is zero. Then the ratio of the currents in the loop and the straight conductors is

    (1) π (2) 2π

    (3) $\dfrac{1}{\pi}$ (4) $\dfrac{1}{2\pi}$

37. Two tangent galvanometers, which are identical except in their number of turns, are connected in parallel. The ratio of their resistances of the coils is 1 : 3. If the deflections in the two tangent galvanometers are 30° and 60° respectively, then the ratio of their number of turns is

    (1) 1 : 1   (2) 3 : 1

    (3) 1 : 2   (4) 1 : 6

Space For Rough Work

38. A charged particle with a velocity 2×10^3 ms^{-1} passes undeflected through electric field and magnetic fields in mutually perpendicular directions. The magnetic field is 1.5 T. The magnitude of electric field will be

(1) 1.5×10^3 NC^{-1} (2) 2×10^3 NC^{-1}

(3) 3×10^3 NC^{-1} (4) 1.33×10^3 NC^{-1}

39. In R-L-C series circuit, the potential differences across each element is 20 V. Now the value of the resistance alone is doubled, then P.D. across R, L and C respectively

(1) 20 V, 10 V, 10 V   (2) 20 V, 20 V, 20 V

(3) 20 V, 40 V, 40 V   (4) 10 V, 20 V, 20 V

40. A rectangular coil of 100 turns and size 0.1 m × 0.05 m is placed perpendicular to a magnetic field of 0.1 T. If the field drops to 0.05 T in 0.05 second, the magnitude of the e.m.f. induced in the coil is

(1) $\sqrt{2}$ (2) $\sqrt{3}$

(3) $\sqrt{0.6}$ (4) $\sqrt{6}$

41. In the circuit diagram, heat produces in R, 2R and 1.5R are in the ratio of
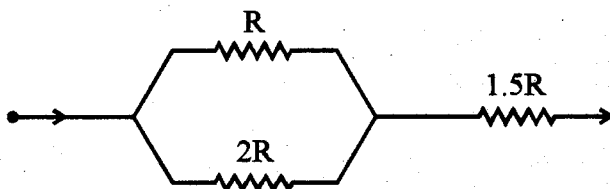
(1) 4 : 2 : 3   (2) 8 : 4 : 27

(3) 2 : 4 : 3   (4) 27 : 8 : 4

Space For Rough Work

42. A series combination of resistor (R), capacitor (C) is connected to an A.C. source of angular frequency 'ω'. Keeping the voltage same, if the frequency is changed to ω/3, the current becomes half of the original current. Then the ratio of the capacitive reactance and resistance at the former frequency is

    (1) $\sqrt{0.6}$ (2) $\sqrt{3}$

    (3) $\sqrt{2}$ (4) $\sqrt{6}$

43. Pick out the correct statement from the following :

    (1) Mercury vapour lamp produces line emission spectrum.

    (2) Oil flame produces line emission spectrum.

    (3) Band spectrum helps us to study molecular structure.

    (4) Sunlight spectrum is an example for line absorption spectrum.

44. Light emitted during the deexcitation of electron from n = 3 to n = 2, when incident on a metal, photoelectrons are just emitted from that metal. In which of the following deexcitations photoelectric effect is not possible ?

    (1) From n = 2 to n = 1   (2) From n = 3 to n = 1

    (3) From n = 5 to n = 2   (4) From n = 4 to n = 3

45. The additional energy that should be given to an electron to reduce its de-Broglie wavelength from 1 nm to 0.5 nm is

    (1) 2 times the initial kinetic energy

    (2) 3 times the initial kinetic energy

    (3) 0.5 times the initial kinetic energy

    (4) 4 times the initial kinetic energy

46. The ionisation energy of an electron in the ground state of helium atom is 24.6 eV. The energy required to remove both the electron is

    (1) 51.8 eV   (2) 79 eV

    (3) 38.2 eV   (4) 49.2 eV

Space For Rough Work

47.

```
————————————————3E
————————————————5E/3
————————————————E
```

The figure shows the energy level of certain atom. When the electron deexcites from 3E to E, an electromagnetic wave of wavelength λ is emitted. What is the wavelength of the electromagnetic wave emitted when the electron deexcites from $\frac{5E}{3}$ to E ?

(1) 3λ

(2) 2λ

(3) 5λ

(4) $\frac{3\lambda}{5}$

48. Maximum velocity of the photoelectron emitted by a metal is 1.8×10^6 ms^{-1}. Take the value of specific charge of the electron is 1.8×10^{11} C kg^{-1}. Then the stopping potential in volt is

(1) 1

(2) 3

(3) 9

(4) 6

49. λ_1 and λ_2 are used to illuminate the slits. β_1 and β_2 are the corresponding fringe widths. The wavelength λ_1 can produce photoelectric effect when incident on a metal. But the wavelength λ_2 cannot produce photoelectric effect. The correct relation between β_1 and β_2 is

(1) $\beta_1 < \beta_2$

(2) $\beta_1 = \beta_2$

(3) $\beta_1 > \beta_2$

(4) $\beta_1 \geq \beta_2$

50. Pick out the correct statement/s from the following :

(a) Electron emission during β-decay is always accompanied by neutrino.

(b) Nuclear force is charge independent.

(c) Fusion is the chief source of stellar energy.

(1) (a), (b) are correct.

(2) (a), (c) are correct.

(3) only (a) is correct.

(4) (b), (c) are correct.

Space For Rough Work

51. A nucleus $_Z X^A$ emits an α-particle with velocity v. The recoil speed of the daughter nucleus is

   (1) $\dfrac{A-4}{4v}$

   (2) $\dfrac{4v}{A-4}$

   (3) v

   (4) $\dfrac{v}{4}$

52. A radioactive substance emits 100 beta particles in the first 2 seconds and 50 beta particles in the next 2 seconds. The mean life of the sample is

   (1) 4 seconds

   (2) 2 seconds

   (3) $\dfrac{2}{0.693}$ seconds

   (4) 2×0.693 seconds

53. In which of the following statements, the obtained impure semiconductor is of p-type ?

   (1) Germanium is doped with bismuth

   (2) Silicon is doped with antimony

   (3) Germanium is doped with gallium

   (4) Silicon is doped with phosphorus

54. The width of the depletion region in a P-N junction diode is

   (1) increased by reverse bias

   (2) increased by forward bias

   (3) decreased by reverse bias

   (4) independent of the bias voltage

55. When the transistor is used as an amplifier

   (1) Emitter-base junction must be reverse biased, Collector-base junction must be forward biased.

   (2) Emitter-base junction must be forward biased, Collector-base junction must be forward biased.

   (3) Emitter-base junction must be reverse biased, Collector-base junction must be reverse biased.

   (4) Emitter-base junction must be forward biased, Collector-base junction must be reverse biased.

Space For Rough Work

56. Which of the following is not made by quarks ?

    (1) Neutron   (2) Positron

    (3) Proton   (4) π-meson

57. Which one of the following is NOT correct ?

    (1) In forward biased condition diode conducts.

    (2) If the packing fraction is negative, the element is stable.

    (3) Binding energy is the energy equivalent to mass defect.

    (4) Radioactive element can undergo spontaneous fission.

58. The output of an OR gate is connected to both the inputs of a NAND gate. The combination will serve as

    (1) AND gate   (2) NOT gate

    (3) NAND gate   (4) NOR gate

59. A and B are the two radioactive elements. The mixture of these elements show a total activity of 1200 disintegrations/minute. The half life of A is 1 day and that of B is 2 days. What will be the total activity after 4 days ? Given : The initial number of atoms in A and B are equal.

    (1) 200 dis/min   (2) 250 dis/min

    (3) 500 dis/min   (4) 150 dis/min

60. The binding energy/nucleon of deuteron ($_1H^2$) and the helium atom ($_2He^4$) are 1.1 MeV and 7 MeV respectively. If the two deuteron atoms fuse to form a single helium atom, then the energy released is

    (1) 26.9 MeV   (2) 25.8 MeV

    (3) 23.6 MeV   (4) 12.9 MeV

Space For Rough Work

A-1

DOs :
1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2nd **Bell i.e., after 2.30 p.m.**
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS :
1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. The 3rd **Bell rings at 2.40 p.m., till then;**
   * Do not remove the paper seal present on the right hand side of this question booklet.
   * Do not look inside this question booklet.
   * Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the 3rd **Bell is rung at 2.40 p.m.,** remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   * Read each question carefully.
   * Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   * **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :
① ● ③ ④

4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 3.50 p.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

C   **[Turn Over**

1. The process of zone refining is used in the purification of
   - (1) A*l*
   - (2) Ge
   - (3) Cu
   - (4) Ag

2. The number of water molecules present in a drop of water weighing 0.018 gm is
   - (1) 6.022×10^{26}
   - (2) 6.022×10^{23}
   - (3) 6.022×10^{19}
   - (4) 6.022×10^{20}

3. Empirical formula of a compound is CH_2O and its molecular mass is 90, the molecular formula of the compound is
   - (1) $C_3H_6O_3$
   - (2) $C_2H_4O_2$
   - (3) $C_6H_{12}O_6$
   - (4) CH_2O

4. Hybridised states of carbon in Graphite and Diamond are respectively
   - (1) sp^3, sp^3
   - (2) sp^3, sp^2
   - (3) sp^2, sp^2
   - (4) sp^2, sp^3

5. The mass of 112 cm^3 of NH_3 gas at STP is
   - (1) 0.085 g
   - (2) 0.850 g
   - (3) 8.500 g
   - (4) 80.500 g

Space For Rough Work

6. IUPAC name of $CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - \underset{\underset{COOH}{|}}{CH} - CH_3$ is

   (1) 4-hydroxy 1 methyl pentanoic acid

   (2) 4-hydroxy 2 methyl pentanoic acid

   (3) 2-hydroxy 4 methyl pentanoic acid

   (4) 2-hydroxy 2 methyl pentanoic acid

7. Alkali metals have negative reduction potential and hence they behave as

   (1) Oxidising agents   (2) Lewis bases

   (3) Reducing agents   (4) Electrolytes

8. Which of the following gases has the highest value of RMS-velocity at 298 K ?

   (1) CH_4 (2) CO

   (3) Cl_2 (4) CO_2

9. Cycloalkane formed when 1, 4-dibromopentane is heated with Sodium is

   (1) Methyl cyclobutane   (2) Cyclopentane

   (3) Cyclobutane   (4) Methyl cyclopentane

Space For Rough Work

C   3   A-1

10. In the reaction, $2FeSO_4 + H_2SO_4 + H_2O_2 \rightarrow Fe_2(SO_4)_3 + 2H_2O$, the oxidizing agent is

(1) $FeSO_4$

(2) H_2SO_4

(3) H_2O_2

(4) Both H_2SO_4 and H_2O_2

11. Given Thermochemical equation, $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$; $\Delta H = -571.6$ kJ. Heat of decomposition of water is

(1) -571.6 kJ

(2) $+571.6$ kJ

(3) -1143.2 kJ

(4) $+285.8$ kJ

12. In Buna-S, the symbol 'Bu' stands for

(1) 1-Butene

(2) n-Butene

(3) 2-Butene

(4) Butadiene

13. The electronic configuration of Cu^{2+} ion is

(1) $[Ar] 3d^8 4s^1$

(2) $[Ar] 3d^9 4s^0$

(3) $[Ar] 3d^7 4s^2$

(4) $[Ar] 3d^8 4s^0$

Space For Rough Work

14. The yield of the products in the reaction, $A_{2(g)} + 2B_{(g)} \rightleftharpoons C_{(g)} + Q.$ kJ would be higher at

    (1)   High temperature and high pressure

    (2)   High temperature and low pressure

    (3)   Low temperature and high pressure

    (4)   Low temperature and low pressure

15. Mesomeric effect involves

    (1)   delocalisation of π -electrons

    (2)   delocalisation of σ-electrons

    (3)   partial displacement of electrons

    (4)   delocalisation of π and σ electrons

16. Which one of the following sets of ions represents the collection of isoelectronic species ?

    (1) $K^+, Cl^-, Mg^{2+}, Sc^{3+}$ (2) $Na^+, Ca^{2+}, Sc^{3+}, F^-$

    (3) $K^+, Ca^{2+}, Sc^{3+}, Cl^-$ (4) $Na^+, Mg^{2+}, Al^{3+}, Cl^-$

17. Adsorption theory is applicable for

    (1)   Homogeneous catalysis   (2)   Heterogeneous catalysis

    (3)   Autocatalysis   (4)   Induced catalysis

18. Methane can be converted into Ethane by the reactions

    (1)   Chlorination followed by the reaction with alcoholic KOH.

    (2)   Chlorination followed by the reaction with aqueous KOH.

    (3)   Chlorination followed by Wurtz reaction.

    (4)   Chlorination followed by decarboxylation.

19. Intramolecular Hydrogen bonding is formed in

    (1) H_2O (2)   Salicylaldehyde

    (3) NH_3 (4)   Benzophenone

20. If 50% of the reactant is converted into a product in a first order reaction in 25 minutes, how much of it would react in 100 minutes ?

    (1)   93.75%   (2)   87.5%

    (3)   75%   (4)   100%

21. The number of optical isomers of the compound $CH_3 - CHBr - CHBr - COOH$ is

    (1)   0   (2)   1

    (3)   3   (4)   4

Space For Rough Work

22. When limestone is heated, CO_2 is given off. The metallurgical operation is

(1) Smelting

(2) Reduction

(3) Calcination

(4) Roasting

23. The rate of reaction increases with rise in temperature because of

(1) increase in number of activated molecules.

(2) increase in energy of activation.

(3) decrease in energy of activation.

(4) increase in the number of effective collisions.

24. Meso compounds do not show optical activity because

(1) they do not contain chiral carbon atoms.

(2) they have non-super imposable mirror images.

(3) they contain plane of symmetry.

(4) they do not contain plane of symmetry.

25. When formic acid is heated with concentrated H_2SO_4, the gas evolved is

(1) only CO_2

(2) only 'CO'

(3) a mixture of 'CO' and 'CO_2'

(4) a mixture of 'SO_2' and 'CO_2'

Space For Rough Work

26. Temperature coefficient of a reaction is '2'. When temperature is increased from 30 °C to 90 °C, the rate of reaction is increased by

    (1)   60 times   (2)   64 times

    (3)   150 times   (4)   400 times

27. Conversion of benzene to acetophenone can be brought by

    (1)   Wurtz reaction   (2)   Wurtz-Fittig's reaction

    (3)   Friedel Crafts alkylation   (4)   Friedel Crafts acylation

28. Excess of PCl_5 reacts with concentrated H_2SO_4 giving

    (1)   Chlorosulphuric acid   (2)   Sulphurous acid

    (3)   Sulphuryl chloride   (4)   Thionyl chloride

29. An example for a neutral buffer is

    (1)   Ammonium hydroxide and Ammonium chloride

    (2)   Acetic acid and Sodium acetate

    (3)   Acetic acid and Ammonium hydroxide

    (4)   Citric acid and Sodium citrate

Space For Rough Work

30. Least energetic conformation of cyclohexane is

    (1) Chain conformation   (2) Boat conformation

    (3) Cis conformation   (4) E-z form

31. Which of the following is employed in flash tubes in photography ?

    (1) Ar   (2) Ne

    (3) Kr   (4) Xe

32. Conjugate base of $H_2PO_4^-$ is

    (1) HPO_4^- (2) HPO_4^{2-}

    (3) H_3PO_4 (4) PO_4^{3-}

33. An alkyl bromide (X) reacts with Sodium in ether to form 4, 5-diethyl octane, the compound 'X' is

    (1) $CH_3(CH_2)_3Br$ (2) $CH_3(CH_2)_5Br$

    (3) $CH_3(CH_2)_3CH(Br)CH_3$ (4) $CH_3-(CH_2)_2-CH(Br)-CH_2-CH_3$

34. Which one of the following shows highest magnetic moment ?

    (1) Fe^{2+} (2) CO^{2+}

    (3) Cr^{3+} (4) Ni^{2+}

Space For Rough Work

35. The emf of a galvanic cell constituted with the electrodes Zn^{2+} | Zn (– 0.76 V) and Fe^{2+}| Fe(–0.41 V) is

(1) – 0.35 V

(2) + 1.17 V

(3) + 0.35 V

(4) – 1.17 V

36. Which of the following pairs are correctly matched ?

	Reactants	Products
I.	$RX + AgOH_{(aq)}$	RH
II.	$RX + AgCN_{(alco)}$	RNC
III.	$RX + KCN_{(alco)}$	RNC
IV.	$RX + Na_{(ether)}$	R–R

(1) I alone

(2) I and II

(3) II and III

(4) II and IV

37. In a transition series, with the increase in atomic-number, the paramagnetism

(1) increases gradually

(2) decreases gradually

(3) first increases to a maximum and then decreases

(4) first decreases to a minimum and then increases

Space For Rough Work

38. Identify a species which is 'NOT' a Bronsted acid but a Lewis acid.

   (1) BF_3 (2) $H_3\overset{+}{O}$

   (3) NH_3 (4) HCl

39. The compound formed when calcium acetate and calcium formate is dry distilled.

   (1) Acetone   (2) Acetaldehyde

   (3) Benzaldehyde   (4) Acetophenone

40. d^2sp^3 hybridisation of the atomic orbitals gives

   (1) Square planar structure   (2) Triangular structure

   (3) Tetrahedral structure   (4) Octahedral structure

41. The pH of $10^{-8}M$ HCl solution is

   (1) 8   (2) 6.9586

   (3) More than 8   (4) Slightly more than 7

Space For Rough Work

42. Which of the following is strongly acidic ?

    (1)   Phenol

    (2)   o-cresol

    (3)   p-nitrophenol

    (4)   p-cresol

43. A group of atoms can function as a ligand only when

    (1)   it is a small molecule.

    (2)   it has an unshared electron pair.

    (3)   it is a negatively charged ion.

    (4)   it is a positively charged ion.

44. Which of the following is 'NOT' a colligative property ?

    (1)   Elevation in boiling point

    (2)   Depression in freezing point

    (3)   Osmotic pressure

    (4)   Lowering of vapour pressure

45. Acetone and Propanal are

    (1)   Functional isomers

    (2)   Position isomers

    (3)   Geometrical isomers

    (4)   Optical isomers

46. Which of the following is diamagnetic ?

    (1) H_2^+

    (2) He_2^+

    (3) O_2

    (4) N_2

Space For Rough Work

3 gms of urea is dissolved in 45 gms of H_2O. The relative lowering in vapour pressure is

(1) 0.05

(2) 0.04

(3) 0.02

(4) 0.01

48. The reagent used to distinguish between acetaldehyde and benzaldehyde is

(1) Tollen's reagent

(2) Fehling's solution

(3) 2-4-dinitrophenyl hydrazine

(4) Semicarbazide

49. Metallic lustre is due to

(1) high density of metals

(2) high polish on the surface of metals

(3) reflection of light by mobile electrons

(4) chemical inertness of metals

50. Which of the following aqueous solutions will exhibit highest boiling point ?

(1) 0.01 M urea

(2) 0.01 M KNO_3

(3) 0.01 M Na_2SO_4

(4) 0.015 M $C_6H_{12}O_6$

Space For Rough Work

51. Which one of the following gives amine on heating with amide ?

    (1) Br_2 in aqueous KOH

    (2) Br_2 in alcoholic KOH

    (3) Cl_2 in Sodium

    (4) Sodium in Ether

52. The number of antibonding electrons present in O_2^- molecular ion is

    (1) 8

    (2) 6

    (3) 5

    (4) 4

53. The process is spontaneous at the given temperature, if

    (1) ΔH is +ve and ΔS is –ve

    (2) ΔH is –ve and ΔS is +ve

    (3) ΔH is +ve and ΔS is +ve

    (4) ΔH is +ve and ΔS is equal to zero

54. Glucose when reduced with HI and Red Phosphorus gives

    (1) n-hexane

    (2) n-heptane

    (3) n-pentane

    (4) n-octane

55. The stability of a Lyophobic colloid is due to

    (1) Adsorption of covalent molecules on the colloid

    (2) The size of the particles

    (3) The charge on the particles

    (4) Tyndall effect

Space For Rough Work

56. Oils are liquids at room temperature since they contain higher percentage of

(1) Oleates

(2) Palmitates

(3) Stearates

(4) Myristates

57. Which of the following cations will have minimum flocculation value for arsenic sulphide sol ?

(1) Na^+

(2) Mg^{2+}

(3) Ca^{2+}

(4) Al^{3+}

58. The value of entropy of solar system is

(1) increasing

(2) decreasing

(3) constant

(4) zero

59. In face centred cubic lattice, a unit cell is shared equally by how many unit cells ?

(1) 6

(2) 4

(3) 2

(4) 8

60. The number of disulphide linkages present in Insulin are

(1) 4

(2) 3

(3) 2

(4) 1

_____

Space For Rough Work

A-1

C

SUBJECT : MATHEMATICS	DAY – 1
SESSION : AFTERNOON	TIME : 02.30 P.M. TO 03.50 P.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A - 1	310545

DOs :

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2nd Bell i.e., after 2.30 p.m.
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS :

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. The 3rd Bell rings at 2.40 p.m., till then;
   • Do not remove the paper seal present on the right hand side of this question booklet.
   • Do not look inside this question booklet.
   • Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the 3rd Bell is rung at 2.40 p.m., remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   • Read each question carefully.
   • Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   • Completely darken / shade the relevant circle with a **BLUE OR BLACK INK BALL POINT PEN** against the question number on the OMR answer sheet.

Correct Method of shading the circle on the OMR answer sheet is as shown below :
① ● ③ ④

4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 3.50 p.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

M

[Turn Over

1. If $\dfrac{(x+1)^2}{x^3+x} = \dfrac{A}{x} + \dfrac{Bx+C}{x^2+1}$, then

   $\sin^{-1} A + \tan^{-1} B + \sec^{-1} C =$ _____

   (1) $\dfrac{\pi}{2}$

   (2) $\dfrac{\pi}{6}$

   (3) 0

   (4) $\dfrac{5\pi}{6}$

2. The sum of the series,

   $\dfrac{1}{2.3} \cdot 2 + \dfrac{2}{3.4} \cdot 2^2 + \dfrac{3}{4.5} \cdot 2^3 + \ldots\ldots\ldots$ to n terms is _____

   (1) $\dfrac{2^{n+1}}{n+2} + 1$

   (2) $\dfrac{2^{n+1}}{n+2} - 1$

   (3) $\dfrac{2^{n+1}}{n+2} + 2$

   (4) $\dfrac{2^{n+1}}{n+2} - 2$

3. If the roots of the equation $x^3 + ax^2 + bx + c = 0$ are in A.P., then $2a^3 - 9ab =$ _____

   (1) 9c

   (2) 18c

   (3) 27c

   (4) –27c

4. If the value of

   $C_0 + 2 \cdot C_1 + 3 \cdot C_2 + \ldots\ldots\ldots + (n+1) \cdot C_n = 576$, then n is _____

   (1) 7

   (2) 5

   (3) 6

   (4) 9

Space For Rough Work

5. The inverse of the proposition $(p \wedge \sim q) \to r$ is _____

    (1) $(\sim r) \to (\sim p) \vee q$ (2) $(\sim p) \vee q \to (\sim r)$

    (3) $r \to p \wedge (\sim q)$ (4) $(\sim p) \vee (\sim q) \to r$

6. The range of the function $f(x) = \sin [x]$, $-\dfrac{\pi}{4} < x < \dfrac{\pi}{4}$ where $[x]$ denotes the greatest integer $\leq x$, is _____

    (1) $\{0\}$ (2) $\{0, -1\}$

    (3) $\{0, \pm \sin 1\}$ (4) $\{0, -\sin 1\}$

7. If the line $6x - 7y + 8 + \lambda(3x - y + 5) = 0$ is parallel to y-axis, then $\lambda =$ _____

    (1) -7 (2) -2

    (3) 7 (4) 2

8. The angle between the lines $\sin^2\alpha \cdot y^2 - 2xy \cdot \cos^2\alpha + (\cos^2\alpha - 1)x^2 = 0$ is _____

    (1) $90°$ (2) α

    (3) $\dfrac{\alpha}{2}$ (4) 2α

9. The minimum area of the triangle formed by the variable line $3 \cos\theta \cdot x + 4 \sin\theta \cdot y = 12$ and the co-ordinate axes is _____

    (1) 144 (2) $\dfrac{25}{2}$

    (3) $\dfrac{49}{4}$ (4) 12

Space For Rough Work

10. log (sin 1°) · log(sin 2°) · log(sin 3°) ……….. log(sin 179°)

    (1)   is positive   (2)   is negative

    (3)   lies between 1 and 180   (4)   is zero

11. If $\sin x - \sin y = \dfrac{1}{2}$ and $\cos x - \cos y = 1$, then $\tan(x + y) =$ _____

    (1) $\dfrac{3}{8}$ (2) $-\dfrac{3}{8}$

    (3) $\dfrac{4}{3}$ (4) $-\dfrac{4}{3}$

12. In a triangle ABC, if $\dfrac{\cos A}{a} = \dfrac{\cos B}{b} = \dfrac{\cos C}{c}$ and $a = 2$, then its area is _____

    (1) $2\sqrt{3}$ (2) $\sqrt{3}$

    (3) $\dfrac{\sqrt{3}}{2}$ (4) $\dfrac{\sqrt{3}}{4}$

13. $\displaystyle \lim_{x \to 0} \dfrac{\log_e (1 + x)}{3^x - 1} =$ _____

    (1) $\log_e 3$ (2) 0

    (3) $\log_3 e$ (4) 1

Space For Rough Work

14. Let $f(x) = \begin{cases} x, & \text{if } x \text{ is irrational} \\ 0 & \text{if } x \text{ is rational} \end{cases}$

then f is _____
- (1) continuous everywhere
- (2) discontinuous everywhere
- (3) continuous only at $x = 0$
- (4) continuous at all rational numbers

15. In a regular graph of 15 vertices the sum of the degree of the vertices is 60. Then the degree of each vertex is _____
- (1) 5
- (2) 3
- (3) 4
- (4) 2

16. The remainder when,

$10^{10} \cdot (10^{10} + 1)(10^{10} + 2)$ is divided by 6 is _____
- (1) 2
- (2) 4
- (3) 0
- (4) 6

17. A value of x satisfying $150\, x \equiv 35 \ (\text{Mod } 31)$ is _____
- (1) 14
- (2) 22
- (3) 24
- (4) 12

18. The smallest positive divisor greater than 1 of a composite number 'a' is _____
- (1) $< \sqrt{a}$
- (2) $= \sqrt{a}$
- (3) $> \sqrt{a}$
- (4) $\leq \sqrt{a}$

Space For Rough Work

19. If A and B are square matrices of order 'n' such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be true ?

       (1)   Either of A or B is zero matrix.

       (2) $A = B$

       (3) $AB = BA$

       (4)   Either of A or B is an identity matrix.

20. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $\left| A^3 \right| = 125$, then $\alpha = $ _____

       (1) ± 1 (2) ± 2

       (3) ± 3 (4) ± 5

21. If $A = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$ and $B = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$, then $\dfrac{dA}{dx} = $ _____

       (1) $3B + 1$ (2) $3B$

       (3) $-3B$ (4) $1 - 3B$

22. If the determinant of the adjoint of a (real) matrix of order 3 is 25, then the determinant of the inverse of the matrix is

       (1) 0.2   (2) ± 5

       (3) $\dfrac{1}{\sqrt[5]{625}}$ (4) ± 0.2

Space For Rough Work

23. If the matrix $\begin{bmatrix} 2 & 3 \\ 5 & -1 \end{bmatrix} = A + B$, where A is symmetric and B is skew symmetric, then
    B = _____

    (1) $\begin{bmatrix} 2 & 4 \\ 4 & -1 \end{bmatrix}$

    (2) $\begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$

    (3) $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

    (4) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

24. In a group (G, *), for some element 'a' of G, if $a^2 = e$, where e is the identity element, then

    (1) $a = a^{-1}$

    (2) $a = \sqrt{e}$

    (3) $a = \dfrac{1}{a^2}$

    (4) $a = e$

25. In the group (Z, *), if $a * b = a + b - n$ $\forall$ a, b $\in$ Z, where n is a fixed integer, then the inverse of (–n) is _____

    (1) n

    (2) –n

    (3) –3n

    (4) 3n

26. If $\vec{a} = (1, 2, 3)$, $\vec{b} = (2, -1, 1)$, $\vec{c} = (3, 2, 1)$ and $\vec{a} \times (\vec{b} \times \vec{c}) = \alpha\vec{a} + \beta\vec{b} \times \gamma\vec{c}$, then

    (1) $\alpha = 1, \beta = 10, \gamma = 3$

    (2) $\alpha = 0, \beta = 10, \gamma = -3$

    (3) $\alpha + \beta + \gamma = 8$

    (4) $\alpha = \beta = \gamma = 0$

27. If $\vec{a} \perp \vec{b}$ and $(\vec{a} + \vec{b}) \perp (\vec{a} + m\vec{b})$, then m = _____

    (1) –1

    (2) 1

    (3) $\dfrac{-|\vec{a}|^2}{|\vec{b}|^2}$

    (4) 0

Space For Rough Work

28. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, then $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a} = $ _____

    (1) $\dfrac{3}{2}$ (2) $-\dfrac{3}{2}$

    (3) $\dfrac{2}{3}$ (4) $\dfrac{1}{2}$

29. If $\vec{a}$ is vector perpendicular to both $\vec{b}$ and $\vec{c}$, then

    (1) $\vec{a} \cdot (\vec{b} \times \vec{c}) = 0$ (2) $\vec{a} \times (\vec{b} \times \vec{c}) = \vec{0}$

    (3) $\vec{a} \times (\vec{b} + \vec{c}) = \vec{0}$ (4) $\vec{a} + (\vec{b} + \vec{c}) = \vec{0}$

30. A tangent is drawn to the circle $2x^2 + 2y^2 - 3x + 4y = 0$ at the point 'A' and it meets the line $x + y = 3$ at B(2, 1), then AB = _____

    (1) $\sqrt{10}$ (2) 2

    (3) $2\sqrt{2}$ (4) 0

31. The area of the circle having its centre at (3, 4) and touching the line $5x + 12y - 11 = 0$ is _____

    (1) 16π sq. units   (2) 4π sq. units

    (3) 12π sq. units   (4) 25π sq. units

32. The number of real circles cutting orthogonally the circle $x^2 + y^2 + 2x - 2y + 7 = 0$ is _____

    (1) 0   (2) 1

    (3) 2   (4) infinitely many

Space For Rough Work

33. The length of the chord of the circle $x^2 + y^2 + 3x + 2y - 8 = 0$ intercepted by the y-axis is

   (1) 3

   (2) 8

   (3) 9

   (4) 6

34. $A \equiv (\cos\theta, \sin\theta)$, $B \equiv (\sin\theta, -\cos\theta)$ are two points. The locus of the centroid of $\triangle OAB$, where 'O' is the origin is _____

   (1) $x^2 + y^2 = 3$

   (2) $9x^2 + 9y^2 = 2$

   (3) $2x^2 + 2y^2 = 9$

   (4) $3x^2 + 3y^2 = 2$

35. The sum of the squares of the eccentricities of the conics $\dfrac{x^2}{4} + \dfrac{y^2}{3} = 1$ and $\dfrac{x^2}{4} - \dfrac{y^2}{3} = 1$ is _____

   (1) 2

   (2) $\sqrt{\dfrac{7}{3}}$

   (3) $\sqrt{7}$

   (4) $\sqrt{3}$

36. The equation of the tangent to the parabola $y^2 = 4x$ inclined at an angle of $\dfrac{\pi}{4}$ to the +ve direction of x-axis is _____

   (1) $x + y - 4 = 0$

   (2) $x - y + 4 = 0$

   (3) $x - y - 1 = 0$

   (4) $x - y + 1 = 0$

37. If the distance between the foci and the distance between the directrices of the hyperbola $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$ are in the ratio 3 : 2, then a : b is _____

   (1) $\sqrt{2} : 1$

   (2) $1 : 2$

   (3) $\sqrt{3} : \sqrt{2}$

   (4) $2 : 1$

Space For Rough Work

M

9

A-1

38. If the area of the auxillary circle of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ $(a > b)$ is twice the area of the ellipse, then the eccentricity of the ellipse is _____

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

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

(3) $\frac{1}{\sqrt{2}}$

(4) $\frac{\sqrt{3}}{2}$

39. $\cos\left[2\cos^{-1}\frac{1}{5} + \sin^{-1}\frac{1}{5}\right] = $ _____

(1) $\frac{1}{5}$

(2) $\frac{-2\sqrt{6}}{5}$

(3) $-\frac{1}{5}$

(4) $\frac{\sqrt{6}}{5}$

40. The value of $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$, $x, y > 0$ is

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

(2) $-\frac{\pi}{4}$

(3) $\frac{\pi}{2}$

(4) $-\frac{\pi}{2}$

41. The general solution of $\sin x - \cos x = \sqrt{2}$, for any integer 'n' is _____

(1) $2n\pi + \frac{3\pi}{4}$

(2) $n\pi$

(3) $(2n+1)\pi$

(4) $2n\pi$

Space For Rough Work

42. The modulus and amplitude of $\dfrac{1+2i}{1-(1-i)^2}$ are _____

(1) $\sqrt{2}$ and $\dfrac{\pi}{6}$

(2) 1 and $\dfrac{\pi}{4}$

(3) 1 and 0

(4) 1 and $\dfrac{\pi}{3}$

43. If $2x = -1 + \sqrt{3}i$, then the value of $(1 - x^2 + x)^6 - (1 - x + x^2)^6 = $ _____

(1) 32

(2) 64

(3) −64

(4) 0

44. If $x + y = \tan^{-1} y$ and $\dfrac{d^2y}{dx^2} = f(y)\,\dfrac{dy}{dx}$, then $f(y) = $ _____

(1) $\dfrac{-2}{y^3}$

(2) $\dfrac{2}{y^3}$

(3) $\dfrac{1}{y}$

(4) $\dfrac{-1}{y}$

45. $f(x) = \begin{cases} 2a - x & \text{when } -a < x < a \\ 3x - 2a & \text{when } a \le x \end{cases}$

Then which of the following is true ?

(1) $f(x)$ is not differentiable at $x = a$.

(2) $f(x)$ is discontinuous at $x = a$.

(3) $f(x)$ is continuous for all $x < a$.

(4) $f(x)$ is differentiable for all $x \ge a$.

Space For Rough Work

M

11

A-1

46. Let $f(x) = \cos^{-1}\left[\dfrac{1}{\sqrt{13}}(2\cos x - 3\sin x)\right]$. Then $f'(0.5) = $ _____

(1) 0.5

(2) 1

(3) 0

(4) −1

47. If $f(x)$ is a function such that $f''(x) + f(x) = 0$ and $g(x) = [f(x)]^2 + [f'(x)]^2$ and $g(3) = 8$, then $g(8) = $ _____

(1) 0

(2) 3

(3) 5

(4) 8

48. If $f(x) = f'(x) + f''(x) + f'''(x) + \ldots\ldots\ldots$ and $f(0) = 1$, then $f(x) = $ _____

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

(2) e^x

(3) e^{2x}

(4) e^{4x}

49. The function $f(x) = \dfrac{x}{3} + \dfrac{3}{x}$ decreases in the interval

(1) $(-3, 3)$

(2) $(-\infty, 3)$

(3) $(3, \infty)$

(4) $(-9, 9)$

Space For Rough Work

A-1

12

M

50. If $\sin^{-1} a$ is the acute angle between the curves $x^2 + y^2 = 4x$ and $x^2 + y^2 = 8$ at $(2, 2)$, then $a = $ _____

(1) 1

(2) 0

(3) $\dfrac{1}{\sqrt{2}}$

(4) $\dfrac{\sqrt{3}}{2}$

51. The maximum area of a rectangle that can be inscribed in a circle of radius 2 units is _____

(1) 8π sq. units

(2) 4 sq. units

(3) 5 sq. units

(4) 8 sq. units

52. If the length of the sub-tangent at any point to the curve $xy^n = a$ is proportional to the abscissa, then 'n' is _____

(1) any non-zero real number

(2) 2

(3) −2

(4) 1

53. $\displaystyle\int \dfrac{\cos^{n-1}x}{\sin^{n+1}x}\,dx,\ n \neq 0$ is _____

(1) $\dfrac{\cot^n x}{n}$

(2) $\dfrac{-\cot^{n-1} x}{n-1}$

(3) $\dfrac{-\cot^n x}{n}$

(4) $\dfrac{\cot^{n-1} x}{n-1}$

Space For Rough Work

M

13

A-1

54. $\int \dfrac{(x-1)\,e^x}{(x+1)^3}\,dx =$ _____

    (1) $\dfrac{e^x}{x+1}$

    (2) $\dfrac{e^x}{(x+1)^2}$

    (3) $\dfrac{e^x}{(x+1)^3}$

    (4) $\dfrac{x \cdot e^x}{(x+1)}$

55. If $I_1 = \displaystyle\int_0^{\pi/2} x \cdot \sin x\, dx$ and

$I_2 = \displaystyle\int_0^{\pi/2} x \cdot \cos x\, dx$, then which one of the following is true ?

    (1) $I_1 = I_2$

    (2) $I_1 + I_2 = 0$

    (3) $I_1 = \dfrac{\pi}{2} \cdot I_2$

    (4) $I_1 + I_2 = \dfrac{\pi}{2}$

56. The value of $\displaystyle\int_{-1}^{2} \dfrac{|x|}{x}\, dx$ is _____

    (1) 0

    (2) 1

    (3) 2

    (4) 3

Space For Rough Work

57. $\displaystyle\int\limits_{0}^{\pi} \dfrac{\cos^4 x}{\cos^4 x + \sin^4 x}\, dx =$ _____

(1) $\dfrac{\pi}{4}$

(2) $\dfrac{\pi}{2}$

(3) $\dfrac{\pi}{8}$

(4) π

58. The area bounded by the curve $y = \sin\left(\dfrac{x}{3}\right)$, x-axis and lines $x = 0$ and $x = 3\pi$ is _____

(1) 9

(2) 0

(3) 6

(4) 3

59. The general solution of the differential equation $\sqrt{1 - x^2 y^2} \cdot dx = y \cdot dx + x \cdot dy$ is _____

(1) $\sin(xy) = x + c$

(2) $\sin^{-1}(xy) + x = c$

(3) $\sin(x + c) = xy$

(4) $\sin(xy) + x = c$

60. If 'm' and 'n' are the order and degree of the differential equation $(y'')^5 + 4 \cdot \dfrac{(y'')^3}{y'''} + y''' = \sin x$, then

(1) $m = 3, n = 5$

(2) $m = 3, n = 1$

(3) $m = 3, n = 3$

(4) $m = 3, n = 2$

Space For Rough Work

A-1

M