Sky Tutorials
fly beyond the sky...
IIT-JEE | NEET | Foundation
JEE

Time: 3 Hours **M.M. 300**

ALL INDIA SKY TEST SERIES

SAARTHAK BATCH – JEE [12th]

Date : 17/09/2023

SYLLABUS

PHYSICS	CHEMISTRY	MATHEMATICS
Previous + Ray Optics + Wave optics + Dual nature of matter & radiation	**Previous + G.O.C + P – block**	**Indefinite integration**

Please read the instructions carefully. You are allotted **5** minutes specifically for this purpose.

INSTRUCTIONS:

1. This Question paper is divided in to three parts Physics, Chemistry and Mathematics each part is further divided into two sections.
   Section –A Contains 20 Questions Section B contains 10 questions. Please ensure that the Questions paper you have received contains **ALL THE QUESTIONS** in each Part.
2. **In Section A all the 20 Questions are compulsory and Section B Contain 10 Question, out of these 10 Questions**, candidates can choose to attempt any 5 Questions.
   Each Question has four choices (A), (B), (C), (D) out of which **only one is correct & Carry 4 marks each 1 mark** will be deducted for each wrong answer.

GENERAL INSTRUCTION

1. Use only **blue/black pen (avoid gel pen)** for darkening the bubble.
2. Indicate the correct answer for each question by filling appropriate bubble in your **OMR** answer sheet.
3. The answer sheet will be checked through computer hence, the answer of the question must be marked by –shading the circles against the question by dark **blue/black pen**
4. Blank papers, Clipboards, Log tables, Slide Rule, Calculator, Cellular Phones Papers and Electronic Gadgets in any form are **not** allowed to be carried inside the examination hall.

Name of the candidate:_____

Signature of the candidate: _____**Signature of the invigilator:**_____

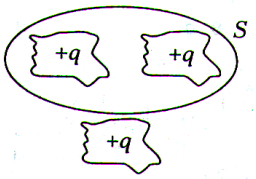
PHYSICS

Section - A

Single Choice Question

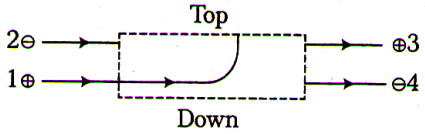
1. Two point charges +2C and +6C repel each other with a force of 12 N. If a charge of –4 C is given to each of these charges, the force now is
(a) 4 N (repulsive) (b) 4 N (attractive)
(c) 12 N (attractive) (d) 8 N (repulsive)

2. Figure shown below is a distribution of charges. The flux of electric field due to these charges through the surface S is



(a) $3q/\varepsilon_0$ (b) $2q/\varepsilon_0$
(c) q/ε_0 (d) zero

3. The figure shows the path of a positively charged particle 1 through a rectangular region of uniform electric field as shown in figure. What is the direction of electric field and the direction of particles 2, 3 and 4?



(a) Top, down, top, down
(b) Top, down, down, top
(c) Down, top, top, down
(d) Down, top, down, down

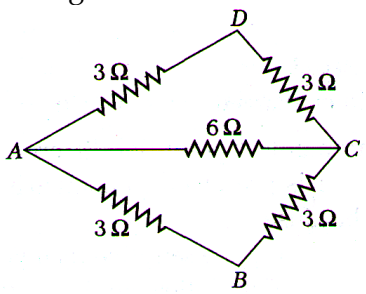
4. If a charged spherical conductor of radius 5 cm has potential V at a point distant 5 cm from its centre, then the potential at a point distant 30 cm from the centre will be
(a) $\frac{1}{3}$V (b) $\frac{1}{6}$V (c) $\frac{3}{2}$V (d) 3 V

5. Kinetic energy of an electron accelerated in a potential difference of 100 V is
(a) 1.6×10^{-17} J (b) 1.6×10^{21} J
(c) 1.6×10^{-29} J (d) 1.6×10^{-34} J

6. The potential of a large liquid drop when eight liquid drops are combined is 20 V. Then, the potential of each single drop was
(a) 10 V (b) 7.5 V (c) 5 V (d) 2.5 V

7. The maximum power dissipated in an external resistance R, when connected to a cell of emf E and internal resistance r, will be
(a) $\frac{E^2}{r}$ (b) $\frac{E^2}{2r}$
(c) $\frac{E^2}{3r}$ (d) $\frac{E^2}{4r}$

8. The effective resistance between the points A and B in the figure is



(a) 5Ω (b) 2Ω
(c) 3Ω (d) 4Ω

9. The temperature coefficient of the resistance of a wire is 0.00125 per ^{0}C. At 300 K its resistance is 1Ω. The resistance of wire will be 2Ω at
(a) 1154 K (b) 1100 K
(c) 1400 K (d) 1127 K

10. Ionised hydrogen atoms and $\alpha-$particles with same momenta enters perpendicular to a constant magnetic field B. The ratio of their radii of their paths $r_H : r_\alpha$ will be
(a) 1 : 2 (b) 4 : 1
(c) 1 : 4 (d) 2 : 1

11. A charged particle of mass m and charge q moves along a circular path of radius *r* that is perpendicular to a magnetic field *B*. The time taken by the particle to complete one revolution is
(a) $\frac{2\mu mq}{B}$ (b) $\frac{2\pi q^2B}{m}$
(c) $\frac{2\pi qB}{m}$ (d) $\frac{2\pi m}{qB}$

12. A current of 2A is made to flow through a coil which has only one turn. The magnetic field produced at the centre is $4\pi\times10^{-6}$ Wb/m^2. The radius of the coil is
(a) 0.0001 m (b) 0.01 m
(c) 0.1 m (d) 0.001 m

13. A ray of light passes from a medium A having refractive index 1.6 to the medium B having refractive index 1.5. The value of critical angle of medium A is

(a) $\sin^{-1}\sqrt{\frac{16}{15}}$ (b) $\sin^{-1}\left(\frac{16}{15}\right)$

(c) $\sin^{-1}\left(\frac{1}{2}\right)$ (d) $\sin^{-1}\left(\frac{15}{16}\right)$

14. The refracting angle of a prism is A and refractive index of the material of the prism is cot (A/2). The angle of minimum deviation is

(a) $180^0 - 3A$ (b) $180^0 - 2A$

(c) $90^0 - A$ (d) $180^0 + 2A$

15. The power of a biconvex lens is 10 D and the radius of curvature of each surface is 10 cm. Then, the refractive index of the material of the lens is

(a) $\frac{4}{3}$ (b) $\frac{9}{8}$

(c) $\frac{5}{3}$ (d) $\frac{3}{2}$

16. In Young's double slit interference experiment, using two coherent waves of different amplitudes, the intensities ratio between bright and dark fringes is 3. Then, the value of the wave amplitudes ratio that arrive there is

(a) $\left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)$ (b) $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$

(c) $\sqrt{3}:1$ (d) $1:\sqrt{3}$

17. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 8th bright fringe in the medium lies, where 5th dark fringe lies in air. The refractive index of the medium is nearly

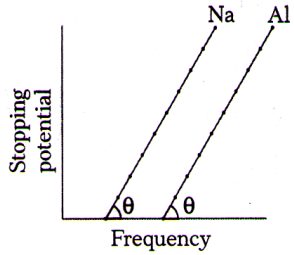
(a) 1.25 (b) 1.59 (c) 1.69 (d) 1.78

18. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio $\frac{I_{max}-I_{min}}{I_{max}+I_{min}}$ will be

(a) $\frac{\sqrt{n}}{n+1}$ (b) $\frac{2\sqrt{n}}{n+1}$

(c) $\frac{\sqrt{n}}{(n+1)^2}$ (d) $\frac{2\sqrt{n}}{(n+1)^2}$

19. On the basis of the figure describing photoelectric effect, which of the following statement is correct?



(a) Na and Al both have the same threshold frequency.

(b) Maximum kinetic energy for both the metals depend linearly on the frequency.

(c) The stopping potentials are different for Na and Al for the same change in frequency.

(d) Al is better photosensitive material than Na.

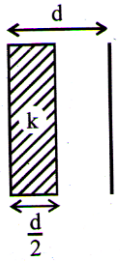
20. A certain metallic surface is illuminated with monochromatic light of wavelength λ. The stopping potential for photoelectric current for this light is $3V_0$. If the same surface is illuminated with light of wavelength 2λ, the stopping potential is V_0. The threshold wavelength for this surface for photoelectric effect is

(a) 6λ (b) 4λ (c) $\frac{\lambda}{4}$ (d) $\frac{\lambda}{6}$

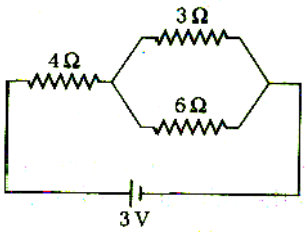
Section - B

Integer Type Questions

21. In a parallel plate capacitor set up, the plate area of capacitor is 2 m^2 and the plates are separated by 1 m. If the space between the plates are filled with a dielectric material of thickness 0.5 m and area 2m^2 (see figure) the capacitance of the set-up will be _____ε_0. (Dielectric constant of the material = 3.2) (Round off to the Nearest Integer).



22. The potential drop across the 3Ω resistor is. (in Volt)



23. The refractive index of a transparent liquid filled in an equilateral hollow prism is $\sqrt{2}$. the angle of minimum deviation for the liquid will be _____.

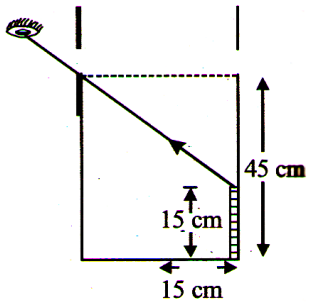
24. A compound microscope consists of an objective lens of focal length 1 cm and an eye piece of focal length 5 cm with a separation of 10 cm.
The distance between an object and the objective lens, at which the strain on the eye is minimum is $\frac{n}{40}$cm.
The value of *n* is ____.

25. Two light beams of intensities 4I and 9I interfere on a screen. The phase difference between these beams on the screen at point A is zero and at point B is π. The difference of resultant intensities, at the point A and B, will be _____ I.

26. When radiation of wavelength λ is used to illuminate a metallic surface, the stopping potential is V. When the same surface is illuminated with radiation of wavelength 3λ, the stopping potential is $\frac{V}{4}$. If the threshold wavelength for the metallic surface is $n\lambda$ then value of n will be _____.

27. A particle of mass 9.1×10^{-31} kg travels in a medium with a speed of 10^6 m/s and a photon of a radiation of linear momentum 10^{-27} kg m/s travels in vacuum. The wavelength of photon is 10 *x* _____ times the wavelength of the particle. Value of *x*

28. An observer can see through a small hole on the side of a jar (radius 15 cm) at a point at height of 15 cm from the bottom (see figure). The hole is at a height of 45 cm. When the jar is filled with a liquid up to a height of 30 cm the same observer can see the edge at the bottom of the jar. If the refractive index of the liquid is N/100, where N is an integer, the value of N/2 is _____.



29. Two identical conducting spheres with negligible volume have 2.1 nC and -0.1 nC charges, respectively. They are brought into contact and then separated by a distance of 0.5 m. The electrostatic force acting between the spheres is _____ $\times10^{-9}$ N.
[Given : $4\pi\varepsilon_0 = \frac{1}{9\times10^9}$ SI unit]

30. 10 resistors each of resistance 10Ω can be connected in such as to get maximum and minimum equivalent resistance. The ratio of maximum and minimum equivalent resistance will be *x* then value of $x/10$ is

CHEMISTRY

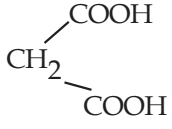
Section - A

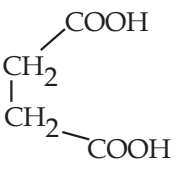
Single Choice Question

31. Write the correct order of acidity

(P) 

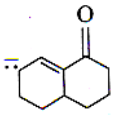
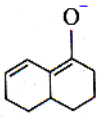
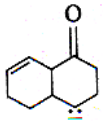
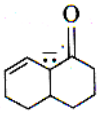
(Q) 

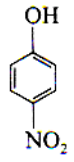
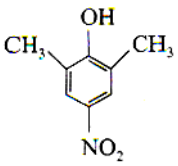
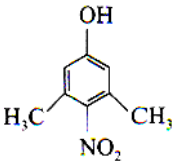
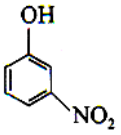
(R) 

(S) 

(a) P > Q > R > S
(b) Q > P > R > S
(c) Q > R > S > P
(d) S > R > Q > P

32. The inductive effects of the group $-CH_3, -COO^-, -Br, -NH_3^+$ respectively are.
(a) $+I, -I, +I, +I$ (b) +I, +I, - I, - I
(c) - I, - I, + I, + I (d) – I, +I, - I, + I

33. Which of the following is not a resonance structure of other?
(a) 
(b) 
(c) 
(d) 

34. Arrange the following in increasing order of acidic strength.
(I) 
(II) 
(III) 
(IV) 

(a) I < II < III < IV (b) I < III < II < IV
(c) I < II < IV < III (d) IV < III < II < I

35. Which of the following resonating structures of 1-methoxy-1, 3-butadiene is least stable?
(a) $\overset{\ominus}{C}H_2-CH_2-CH_2-CH=\overset{\oplus}{O}-CH_3$
(b) $CH_3-CH_2-\overset{\ominus}{C}H-CH=\overset{\oplus}{O}-CH_3$
(c) $\overset{\ominus}{C}H_2-\overset{\oplus}{C}H-CH_2-CH_2-O-CH_3$
(d) $CH_3-CH_2-\overset{\ominus}{C}H-\overset{\oplus}{C}H-O-CH_3$

36. Which of the following arrangements does not represents the correct order of the property stated against it
(a) Sc < Ti < Cr < Mn : number of oxidation states
(b) $V^{2+} < Cr^{2+} < Mn^{2+} < Fe^{2+}$: paramagnetic behaviour
(c) $Ni^{2+} < CO^{2+} < Fe^{2+} < Mn^{2+}$: ionic size
(d) $Co^{3+} < Fe^{3+} < Cr^{3+} < Sc^{3+}$: stability in aqueous solution.

37. General electronic configuration of transition metals is
(a) $(n-1)d^{1-10}ns^2$ (b) $nd^{10}ns^2$
(c) $(n-1)d^{10}ns^2$ (d) $(n-1)d^{1-5}ns^2$

38. Fe^{3+} compounds are more stable than Fe^{2+} compounds because
(a) Fe^{3+} has smaller size than Fe^{2+}
(b) Fe^{3+} has $3d^5$ configuration (half-filled)
(c) Fe^{3+} has higher oxidation state
(d) Fe^{3+} is paramagnetic is nature.

39. Amongst $TiF_6^{2-}, CoF_6^{3-}, CuCl_2$ and $NiCl_4^{2-}$, which are the colourless species ? (atomic number of Ti = 22, Co = 27, Cu = 29, Ni = 28)
(a) CoF_6^{3-} and $NiCl_4^{2-}$ (b) TiF_6^{2-} and Cu_2Cl_2
(c) $CuCl_2$ and $NiCl_4^{2-}$ (d) TiF_6^{2-} and CoF_6^{3-}

40. $CuSO_4$ is paramagnetic while $ZnSO_4$ is diamagnetic because
(a) Cu^{2+} ion has $3d^9$ configuration while Zn^{2+} ion has $3d^{10}$ configuration
(b) Cu^{2+} ion has $3d^5$ configuration while Zn^{3+} ion has $3d^6$ configuration
(c) Cu^{2+} has half filled orbitals while Zn^{2+} has fully filled orbitals
(d) $CuSO_4$ is blue in colour while $ZnSO_4$ is white.

41. Which of the following transition metal ions is colourless?
(a) V^{2+} (b) Cr^{3+} (c) Zn^{2+} (d) Ti^{3+}

42. Which of the following transition metal ions has highest magnetic moment?
(a) Cu^{2+} (b) Ni^{2+} (c) Co^{2+} (d) Fe^{2+}

43. The correct order of number of unpaired electrons is
(a) $Cu^{2+} > Ni^{2+} > Cr^{3+} > Fe^{3+}$
(b) $Ni^{2+} > Cu^{2+} > Fe^{3+} > Cr^{3+}$
(c) $Fe^{3+} > Cr^{3+} > Ni^{2+} > Cu^{2+}$
(d) $Cr^{3+} > Fe^{3+} >> Ni^{2+} > Cu^{2+}$

44. For $Zn^{2+}, Ni^{2+}, Cu^{2+}$ and Cr^{2+} which of the following statements is correct ?
(a) Only Zn^{2+} is colourless and Ni^{2+}, Cu^{2+} and Cr^{2+} are coloured.
(b) All the ions are coloured.
(c) All the ions are colourless.
(d) Zn^{2+} and Cu^{2+} are colourless while Ni^{2+} and Cr^{2+} are coloured.

45. Identify the species in which the metal atom is in +6 oxidation state.
(a) MnO_4^- (b) $Cr(CN)_6^{3-}$
(c) NiF_6^{2-} (d) CrO_2Cl_2

46. Complete the following reactions.
(i) $Cr_2O_7^{2-} + 3SO_2 + 2H^+ \rightarrow 2Cr^{3+} + \_\_\_\_ + H_2O$
(ii) $2MnO_4^- + 5SO_3^{2-} + 6H^+ \rightarrow 2Mn^{2+} + \_\_\_\_ + 3H_2O$
(iii) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + \_\_\_ + 7H_2O$
(a) $3SO_4^{2-}, SO_2^{2-}, Fe^{3+}$ (b) $3SO_4^{2-}, 5SO_4^{2-}, 6Fe^{3+}$
(c) $3SO_4^{2-}, SO_2, K^+$ (d) S, SO_2, Fe^{3+}

47. Arrange the following in increasing value of magnetic moments.
(i) $[Fe(CN)_6]^{4-}$ (ii) $[Fe(CN)_6]^{3-}$
(iii) $[Cr(NH_3)_6]^{3+}$ (iv) $[Ni(H_2O)_4]^{2+}$
(a) (i) < (ii) < (iii) < (iv)
(b) (i) < (ii) < (iv) < (iii)
(c) (ii) < (ii) < (i) < (iv)
(d) (iii) < (i) < (ii) < (iv)

48. Fe^{3+} ion is more stable than Fe^{2+} ion because
(a) more the charge on the atom, more is its stability
(b) configuration of Fe^{2+} is $3d^6$ while Fe^{3+} is $3d^5$
(c) Fe^{2+} has a larger size than Fe^{3+}
(d) Fe^{3+} ions are coloured hence more stable.

49. Colour of transition metal ions are due to absorption of some wavelength. This results in
(a) d-transition (b) s-s transition
(c) s-d transition (d) d-d transition.

50. The melting point of copper is higher than that of zinc because
(a) copper has a bcc structure
(b) the atomic volume of copper is higher
(c) the d electrons of copper are involved in metallic bonding
(d) the s as well as d electrons of copper are involved in metallic bonding.

Section - B

Integer Type Questions

51. 12.2 g of benzoic acid (M*w* = 122) in 100 g water has elevation in boiling point of 0.27. K_b = 0.54 kg mol^{-1}. If there is 100% polymerization, the number of molecular of benzoic acid associated state is

52. The freezing point depression of a 1.00×10^{-3} molal aqueous solution of $K_x[Fe(CN)_6]$ is 7.10×10^{-3} K. If K_f (H_2O) = 1.86 K Kg mol^{-1}, what is the value of x ?

53. Compound $PbCl_4.6H_2O$ is a hydrated complex ; 1 m aqueous solution of it has freezing point 269.28 K. Assuming 100% ionization of complex, calculate the number of ions furnished by complex in the solution.

54. One molal aqueous solution of urea freezes at -1.86^oC. Aqueous solution of $C_nH_{2n}O_n$ 36% mass of water freezes at -3.72^oC. What is the value of n ?

55. How many grams of water will be electrolyzed by 96500 coulomb?

56. The oxidation number of Mn in the product of alkaline oxidative fusion of MnO_2 is

57. The number of water molecule(s) directly bonded to the metal centre in $CuSO_4.5H_2O$ is

58. Total number of geometrical isomers for the complex $[RhCl(CO)(PPh_3)(NH_3)]$ is

59. $EDTA^{4-}$ is ethylenediaminetetraacetate ion. The total number of $N-Co-O$ bond angles in $[Co(EDTA)]^{1-}$

60. Among the complex ions,
$[Co(NH_2CH_2CH_2NH_2)_2Cl_2]^+$,
$[CrCl_2(C_2O_4)_2]^{3-}$, $[Fe(H_2O)_4(OH)_2]^+$,
$Fe(NH_3)_2(CN)_4]^-$, $[Co(NH_3)_4(H_2O)Cl]^{2+}$, the number of complex ion(s) that show(s) *cis-trans* isomerism is

MATHEMATICS

Section - A

Single Choice Question

61. Let $f : A \to B$ be a function defined as $f(x) = \frac{x-1}{x-2}$, where A = R – {2} and B = R – {1}. Then f is

(a) Invertible and $f^{-1}(y) = \frac{2y-1}{y-1}$

(b) Not invertible

(c) Invertible and $f^{-1}(y) = \frac{3y-1}{y-1}$

(d) Invertible and $f^{-1}(y) = \frac{2y+1}{y-1}$

62. For real x, let $f(x) = x^3 + 5x + 1$, then

(a) f is onto on R but not one-one

(b) f is one-one and onto on R

(c) f is neither one-one nor onto on R

(d) f is one-one but not onto on R

63. The function $f(x) = \log(x + \sqrt{x^2+1})$ is

(a) an odd function

(b) a periodic function

(c) neither an even nor an odd function

(d) an even function

64. If $A = \begin{pmatrix} 0 & \sin\alpha \\ \sin\alpha & 0 \end{pmatrix}$ and $\det\left(A^2 - \frac{1}{2}I\right) = 0$, then a possible value of α is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$

65. The number of distinct real roots of the equation, $\begin{vmatrix} \cos x & \sin x & \sin x \\ \sin x & \cos x & \sin x \\ \sin x & \sin x & \cos x \end{vmatrix} = 0$ in the interval $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$ is

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

66. If $A = \begin{pmatrix} 2 & 2 \\ 9 & 4 \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then $10A^{-1}$ is equal to

(a) $6I - A$ (b) A – 6I

(c) 4I-A (d) A-4I

67. The system of linear equations

$3x - 2y - kz = 10$

$2x - 4y - 2z = 6$

$x + 2y - z = 5m$

is inconsistent if

(a) $k = 3, m \neq \frac{4}{5}$ (b) $k \neq 3, m \neq \frac{4}{5}$

(c) $k = 3, m = \frac{4}{5}$ (d) $k \neq 3, m \in R$

68. If the system of equations

$x + y + z = 5, x + 2y + 3z = 9, x + 3y + \alpha z = \beta$

has infinitely many solutions, then $\beta - \alpha$ equals

(a) 5 (b) 8 (c) 21 (d) 18

69. $\lim\limits_{x\to 0} \frac{(27+x)^{1/3} - 3}{9 - (27+x)^{2/3}}$ equals

(a) $-\frac{1}{3}$ (b) $\frac{1}{6}$ (c) $-\frac{1}{6}$ (d) $\frac{1}{3}$

70. $\lim\limits_{x\to 3} \frac{\sqrt{3x} - 3}{\sqrt{2x-4} - \sqrt{2}}$ is equal to

(a) $\sqrt{3}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{2\sqrt{2}}$ (d) $\frac{1}{\sqrt{2}}$

71. If the function f defined on $\left(\frac{\pi}{6}, \frac{\pi}{3}\right)$ by

$$f(x) = \begin{cases} \frac{\sqrt{2}\cos x - 1}{\cot x - 1}, & x \neq \frac{\pi}{4} \\ k, & x = \frac{\pi}{4} \end{cases}$$

is continuous, then k is equal to

(a) 1 (b) $\frac{1}{2}$ (c) 2 (d) $\frac{1}{\sqrt{2}}$

72. If $e^y + xy = e$, the ordered pair $\left(\frac{dy}{dx}, \frac{d^2y}{dx^2}\right)$ at $x = 0$ is equal to

(a) $\left(\frac{1}{e}, \frac{1}{e^2}\right)$ (b) $\left(\frac{1}{e}, -\frac{1}{e^2}\right)$

(c) $\left(-\frac{1}{e}, \frac{1}{e^2}\right)$ (b) $\left(-\frac{1}{e}, -\frac{1}{e^2}\right)$

73. Let $f(x) = 3\sin^4 x + 10\sin^3 x + 6\sin^2 x - 3$, $x \in \left[-\frac{\pi}{6}, \frac{\pi}{2}\right]$. Then, f is

(a) increasing in $\left(-\frac{\pi}{6}, 0\right)$

(b) decreasing in $\left(-\frac{\pi}{6}, 0\right)$

(c) increasing in $\left(-\frac{\pi}{6}, \frac{\pi}{2}\right)$

(d) decreasing in $\left(0, \frac{\pi}{2}\right)$

74. The function f defined by $f(x)=x^3-3x^2+5x+7$ is
(a) decreasing in R.
(b) increasing in R.
(c) decreasing in $(0,\infty)$ and increasing in $(-\infty,0)$.
(d) increasing in $(0,\infty)$ and decreasing $(-\infty,0)$.

75. Area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is
(a) ab (b) 2ab (c) a/b (d) $\sqrt{ab}$

76. The value of a for which the sum of the squares of the roots of the equation $x^2-(a-2)x-a-1=0$ assume the least value is
(a) 0 (b) 1 (c) 2 (d) 3

77. The real number x when added to its inverse gives the minimum value of the sum at x equal to
(a) 1 (b) -1 (c) -2 (d) 2

78. If the function $f(x)=2x^3-9ax^2+12a^2x+1,$ where a > 0, attains its maximum and minimum at p and q respectively such that $p^2=q,$ then a equals
(a) 1 (b) 2 (c) ½ (d) 3

79. Angle between the tangents to the curve $y=x^2-5x+6$ at the points (2,0) and (3,0) is
(a) $\pi/2$ (b) $\pi/3$
(c) $\pi/6$ (d) $\pi/4$

80. The tangent to the curve $y=x^2-5x+5,$ parallel to the line $2y=4x+1,$ also passes through the point
(a) $\left(\frac{7}{2},\frac{1}{4}\right)$ (b) $\left(\frac{1}{4},\frac{7}{2}\right)$
(c) $\left(-\frac{1}{8},7\right)$ (d) $\left(\frac{1}{8},-7\right)$

SECTION - B

Integer Type Questions

81. Let M and m be respectively the absolute maximum and the absolute minimum value of the function, $f(x)=2x^3-9x^2+12x+5$ in the interval [0,3]. Then M-m is equal to

82. The maximum area (in sq. units) of a rectangle having its base on the x-axis and its other two vertices on the parabola, $y=12-x^2$ such that the rectangle lies inside the parabola, is

83. The number of distinct real roots of the equation $3x^4+4x^3-12x^2+4=0$ is _____.

84. Let a be an integer such that all the real roots of the polynomial $2x^5+5x^4+10x^3+10x^2+10x+10$ lie in the interval $(a,a+1)$. Then, $|a|$ is equal to_____.

85. If the tangent to the curve, $y=e^x$ at a point (c,e^c) and the normal to the parabola, $y^2 = 4x$ at the point (1, 2) intersect at the same point on the x-axis, then the value of c is _____.

86. If the lines $x + y = a$ and $x-y = b$ touch the curve $y=x^2-3x+2$ at the points where the curve intersects the x-axis, then $\frac{a}{b}$ is equal to $\frac{k}{4}$ then the value of k is _____.

87. If the function f defined on $\left(-\frac{1}{3},\frac{1}{3}\right)$ by

$$f(x)=\begin{cases}\frac{1}{x}\log_e\left(\frac{1+3x}{1-2x}\right), & when\ x\neq 0\\ k, & when\ x=0\end{cases}$$

is continuous, then k is equal to _____.

88. The number of points, at which the function $f(x)=|2x+1|-3|x+2|+|x^2+x-2|, x\in R$ is not differentiable, is _____.

89. A function f is defined on [-3, 3] as

$$f(x)=\begin{cases}\min\{|x|,2-x^2\}, & -2\le x\le 2\\ [\,|x|\,], & 2<|x|\le 2\end{cases}$$

Where [x] denotes the greatest integer $\le x$. The number of points, where f is not differentiable in (-3,3) is _____.

90. The derivative of $\tan^{-1}\left(\frac{\sin x-\cos x}{\sin x+\cos x}\right)$, with respect to $\frac{x}{2}$, where $\left(x\in\left(0,\frac{\pi}{2}\right)\right)$ is