JEE MAIN- 2024-25
(FULL TEST-1)
(Physics, Chemistry and Mathematics)

11
FULL TEST

Date :- ..... **Time :- 3:00 Hrs.** **Marks :- 300**

Important Instructions :

1. The test duration is of **3 hours**.
2. The Test Booklet consists of 90 questions. The maximum marks are 300.
3. There are **three** parts in the question paper consisting of **Physics, Chemistry** and **Mathematics** having 30 questions in each part of equal weightage. Each part (subject) has two sections.

   (i) **Section-A:** This section contains 20 multiple choice questions which have only one correct answer. Each question carries **4 marks** for correct answer and **–1 mark** for wrong answer.
   (ii) **Section-B:** This section contains 10 questions. In Section-B, attempt any **five questions out of 10.** The answer to each of the questions is a numerical value. Each question carries **4 marks** for correct answer and **–1 mark** for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

Student's Name :- .....
School Name :- .....

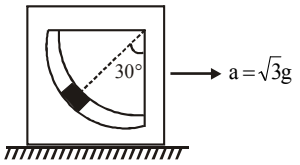
Student's Signature :- ..... **Invigilator's Signature :-** .....

PE

PHYSICS

(SECTION-A)

1. A Wedge with a rough groove in the shape of a quarter of a circle is kept on a smooth table (see figure). A disc is placed in the groove with a small clearance. Friction exists between groove and disc. The wedge is moved with an acceleration $\sqrt{3}g$. If disc is to remain stationary relative to groove at the position shown, the coefficient of friction required can be



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

(C) $\frac{1}{5}$ (D) $\frac{9}{10}$

2. A sheet of aluminium foil of negligible thickness is introduced between the plates of a capacitor. The capacitance of the capacitor –

(A) Remains unchanged

(B) Becomes infinite

(C) Increases

(D) Decreases

3. In a stack of three polarizing sheets the first and third are crossed while the middle one has its axis at 45° to the axes of the other two. The fraction of the intensity of an incident unpolarized beam of light that is transmitted by the stack is

(A) 1/2 (B) 1/3 (C) 1/4 (D) 1/8

4. Two uniform solid spheres A and B of same material, painted completely black and placed in free space separately where no radiation is incident on spheres. Their radii are R and 2R respectively and the dominating wavelengths (wavelength corresponding to which spectral emissive power is maximum) in their spectrum are observed to be in the ratio 1 : 2. Which of the following is **not correct**.

(A) Ratio of their temperatures is 2 : 1

(B) Ratio of their emissive powers is 4 : 1

(C) Ratio of their rates of heat loss is 4 : 1

(D) Ratio of their rates of cooling is 32 : 1

5. If the surface of a metal is successively exposed to radiation of λ_1 = 350 nm and λ_2 = 450 nm, the maximum speed of photoelectrons is halved. The work function of this metal is closest to (given h = 6.62×10^{-34} J - s)

(A) 1.8 eV (B) 2.5 eV

(C) 4.8 eV (D) 3.9 eV

6. A plane wave of monochromatic light falls normally on a uniform thin film of oil which covers a glass plate. The wavelength of source can be varied continuously. Complete constructive interference of reflected lights from air–thin film interface and thin film – glass interface is observed for λ_1 = 5000 Å and λ_2 = 10000 Å and for no other wavelength in between. If refractive index of oil is 1.25 and that of glass is 1.5, the thickness of film (in μm) is

(A) 0.2 (B) 0.1 (C) 0.8 (D) 0.4

7. The shape of a wave propagating in the positive x or negative x- direction is given by y = $\frac{1}{\sqrt{1+x^2}}$ at t = 0 and y = $\frac{1}{\sqrt{2-2x+x^2}}$ at t = 1s where x and y are in meters. The shape of the wave disturbance does not change during propagation. Find the velocity of the wave.

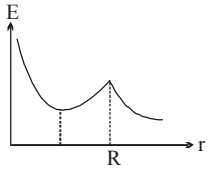
(A) 1 m/s in positive x direction

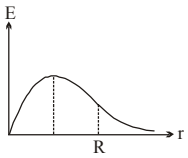
(B) 1 m/s in negative x direction

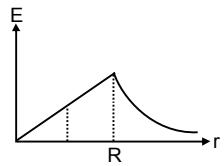
(C) $\frac{1}{2}$ m/s in positive x direction

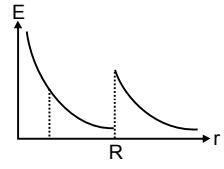
(D) $\frac{1}{2}$ m/s in negative x direction

8. A spherical insulator of radius R is charged uniformly with a charge Q uniformly distributed throughout its volume and contains a point charge $\frac{Q}{16}$ located at its centre. Which of the following graphs best represent qualitatively, the variation of electric field intensity E with distance r from the centre.

(A) 

(B) 

(C) 

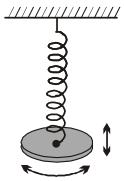
(D) 

9. A particle of specific charge σ moving with a certain velocity v enters a uniform magnetic field of strength B directed along the negative Z-axis entending from $x = r_1$ to $x = r_2$. The minimum value of v required in order that the particle can just enter the region $x > r_2$ is :

(A) $\sigma r_2 B$ (B) $\sigma \sqrt{r_1 r_2}\ B$

(C) $\sigma(r_2 - r_1)\ B$ (D) $\sigma\sqrt{r_2^2 - r_1^2} B$

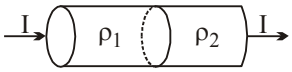
10. A solid disk of radius R is suspended from a spring of linear spring constant k and torsional constant c, as shown in figure. In terms of k and c, what value of R will give the same period for the vertical and torsional oscillations of this system?



(A) $\sqrt{\frac{2c}{k}}$ (B) $\sqrt{\frac{c}{2k}}$

(C) $2\sqrt{\frac{c}{k}}$ (D) $\frac{1}{2}\sqrt{\frac{c}{k}}$

11. Two long straight cylindrical conductors with resistivities ρ_1 and ρ_2 respectively are joined together as shown in figure. The radius of each of the conductor is a. If a uniform total current I flows through the conductors, the magnitude of the total free charge at the interface of the two conductor is

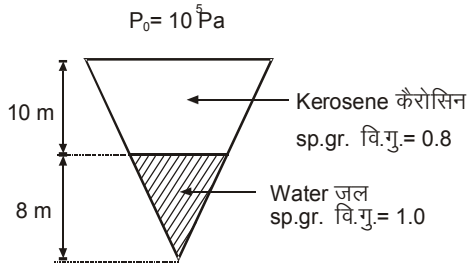


(A) zero (B) $\frac{(\rho_1 - \rho_2) I \varepsilon_0}{2}$

(C) $\varepsilon_0 I\,|\,\rho_1 - \rho_2\,|$ (D) $\varepsilon_0 I\,(\rho_1 + \rho_2)$

12. The figure shows a conical container of half-apex angle 37° filled with certain quantities of kerosene and water. The force exerted by the water on the kerosene is approximately –

(Take atmospheric pressure = 10^5 Pa)



(A) 3×10^7 N (B) 4×10^7 N

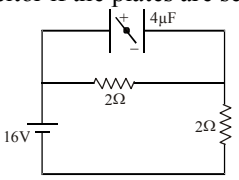
(C) 2×10^7 N (D) 5×10^7 N

13. The half-life of substance X is 45 years, and it decomposes to substance Y. A sample from a meteorite was taken which contained 2% of X and 14% of Y by quantity of substance. If substance Y is not normally found on a meteorite, what is the approximate age of the meteorite?

(A) 270 years (B) 225 years

(C) 180 years (D) 135 years

14. What is net force on the small dipole inside the capacitor if the plates are separated by 1cm?



(A) 0 N (B) 4 N

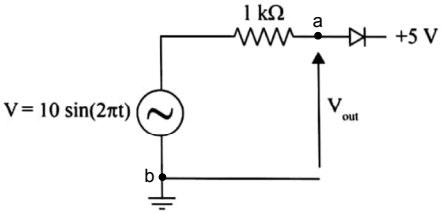
(C) 8 N (D) 16 N

15. A uniform circular ring of radius R is fixed in plane. A particle is placed on the axis of the ring at a distance much greater than R and allowed to fall towards the ring under the influence of the ring's gravity. The particle achieves a maximum speed v. The ring is replaced with one of the same (linear) mass density but radius 2R, and the experiment is repeated. What is the new maximum speed of the particle?

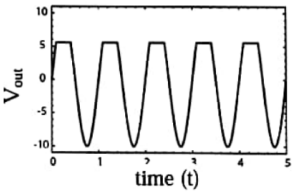
(A) $\frac{1}{2}v$ (B) $\frac{1}{\sqrt{2}}v$

(C) v (D) $\sqrt{2}v$

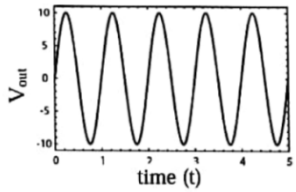
16. Consider the following ideal diode circuit. Which of the graph given below is a correct representation of V_{out} ($V_a - V_b$) ? (Input and output voltage is in volt)

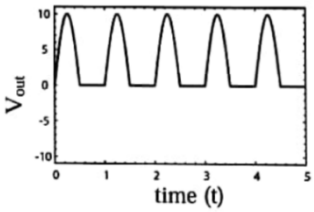


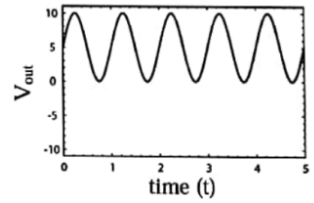
(A)



(B)



(C) 

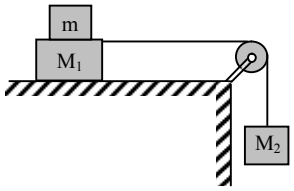
(D) 

17. In an astronomical telescope in normal adjustment a straight black line of lenght L is drawn on just right side of objective lens. The eye-piece forms a real image of this line. The length of this image is I. The angular magnification of the telescope is :

(A) $\frac{L}{I}-1$ (B) $\frac{L+I}{L-I}$

(C) $\frac{L}{I}$ (D) $\frac{L}{I}+1$

18. Two blocks of masses M_1 and M_2 are connected with a string passing over a pulley as shown in figure. The block M_1 lies on a horizontal surface . The coefficient of friction between the block M_1 and the horizontal surface is μ. The system accelerates. What additional mass m should be placed on the block M_1 so that the system does not accelerate?



(A) $\frac{M_2-M_1}{\mu}$ (B) $\frac{M_2}{\mu}-M_1$

(C) $M_2-\frac{M_1}{\mu}$ (D) $(M_2-M_1)\mu$

19. Find the steady state current through L_1 in the Fig. –

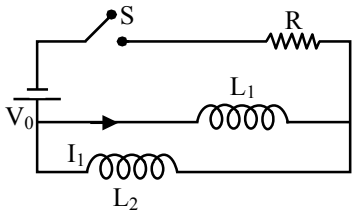


Fig.

(A) $\frac{V_0}{R}$ (B) $\frac{V_0L_1}{R(L_1+L_2)}$

(C) $\frac{V_0L_2}{R(L_1+L_2)}$ (D) None of these

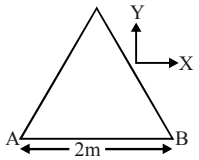
20. A steel rod is 4.000 cm in diameter at 30ºC. A brass ring has an inner diameter of 3.992 cm at 30ºC. In order that the ring just slides onto the steel rod, the common temperature of the two should be approximately (α_{steel}= 11 × 10^{-6}/ºC and α_{brass}= 19 × 10^{-6}/ºC)

(A) 250ºC (B) 280ºC

(C) 300ºC (D) 350ºC

(SECTION-B)

21. A rigid equilateral triangular plate ABC of side 2 m, is in motion in the x-y plane as shown in figure. At the instant shown in the figure, the point B has velocity $\vec{v}_B=(3\hat{i}+8\hat{j})m/s$ and the plate has angular velocity $\vec{\omega}=2\hat{k}$ rad/s. If the speed of point A is 4u (in m/s), then find u.



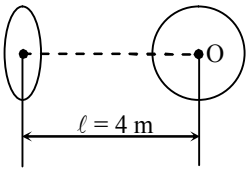
22. A ball is thrown obliquely into the air. At a certain moment, the ball's velocity has an angle of 60º with the horizontal, with an upwards motion. Four seconds later, the angle is of 30º with horizontal, with a downward motion. Determine the sum of magnitude of height (in m) ascended and descended during this time interval. Given g = 10 m/s^2. Ignore air drag on the ball.

23. Dimensional formula of capacitance is written as $[M^{-1}L^{-2}T^{x}A^{+2}]$. Find x. C = $\frac{q^2}{2U}$ where U stands for energy and q charge.

24. In hydrogen atom, the binding energy of an electron in the ground state is E_1, then the frequency of revolution of the electron in the n^{th} orbit is $\frac{xE_1}{n^yh}$. Here x and y are integers. Find the value of x^y.

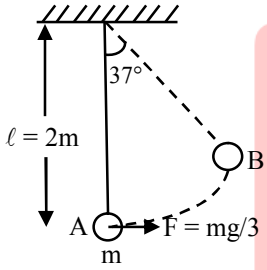
25. A certain thin prism is found to produce a minimum deviation of 40º and produces a deviation of 44º when the angle of incidence is either 42º or 62º. The angle of incidence when light undergoes minimum deviation in degree …. × 10 degree.

26. A thin ring of radius R = 3 m has been uniformly charged with an amount of 20μC and placed in relation to a conducting sphere in such a way that the centre of the sphere O, lies on the rings axis at a distance of ℓ = 4 m from the plane of the ring. The potential of the sphere is ……. × 10^4 volt.



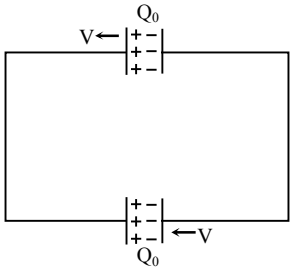
27. The minimum speed in m/s with which a projectile must be thrown from origin at ground so that it is able to pass through a point P (30 m, 40 m) is :(g = 10 m/s^2)

28. A pendulum of mass m = 2kg is pulled from position 'A' by applying a constant horizontal force F = mg/3. Velocity (in m/s) at point 'B' shown in figure -

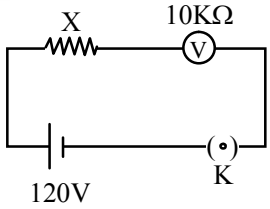


29. Two identical capacitors are connected as shown and having initial charge Q_0. Separation between plates of each capacitor is d_0. Suddenly the left plate of upper capacitor and right plate of lower capacitor start moving with speed v towards left while other plate of each capacitor remains fixed.

(given $\frac{Q_0V}{2d_0}$ = 10 amp). The value of current (in amp) in the circuit is……. × 4 ampere.



30. A D.C. supply of 120 V is connected to a large resistance X. A voltmeter of resistance 10 kΩ placed in series in the circuit reads 20 V. This is an unusual use of voltmeter for measuring very high resistance. The value of X is ……× 10 kΩ (approx).



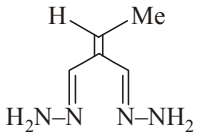
31. Which has the smallest bond angle (X – S – X) in the given molecules?
(A) OSF_2 (B) $OSCl_2$ (C) $OSBr_2$ (D) OSI_2.

32. Which is not true about B_2H_6
(A) Both 'B' atoms are sp^3 hybridised
(B) Boron atom is in ground state
(C) Two hydrogens occupy special positions
(D) There are two, three centre two electron bonds

33. The maximum & minimum melting point of first transition and second transition series elements respectively are obtained with
(A) Cr & Zn (B) Cr & Hg
(C) Cr & Cd (D) Mo & Cd

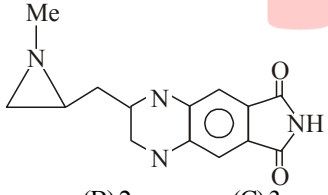
34. The magnetic moment (spin only) of $[NiCl_4]^{2-}$ is :
(A) 1.82 BM (B) 5.46 BM
(C) 2.82 BM (D) 1.41 BM

35. Identify total number of geometrical isomers in given compound?



(A) 2 (B) 4 (C) 6 (D) 8

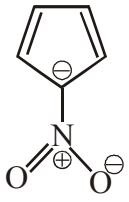
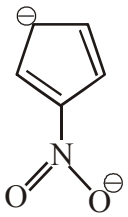
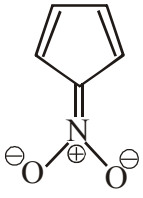
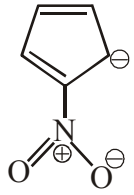
36. Identify total number of 2° amines in given compound?

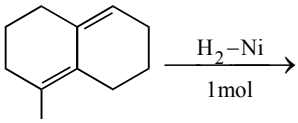


(A) 1 (B) 2 (C) 3 (D) 4

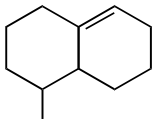
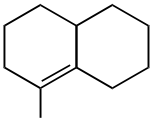
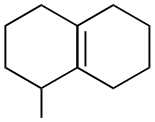
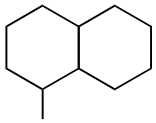
37. Simplest alcohol that can exhibit optical isomerism.
(A) 1-propanol (B) 2-butanol
(C) 2-propanol (D) 1-butanol

38. Which resonating structure is most stable?

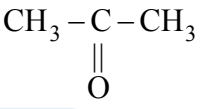
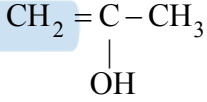
(A) 
(B) 
(C) 
(D) 

39. 

major product of this reaction is:

(A) 
(B) 
(C) 
(D) 

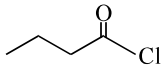
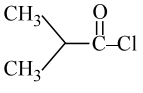
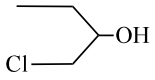
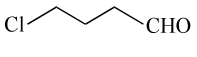
40. $CH_2 = C = CH_2 \xrightarrow[\text{(limited)}]{H_3O^{\oplus}} A$

A is:
(A) CH_2=CH–CH_2–OH
(B) 
(C) 
(D) CH_3CH_2CHO

41. Which is not true about borax?
(A) It is a useful primary standard for titrating against acids
(B) One mole of borax reacts with four moles of HCl
(C) Aqueous solution of borax can be used as a buffer
(D) It is made up of two triangular BO_3 units and two tetrahedral BO_4 units

42. Antimony pentafluoride, SbF_5 reacts with XeF_4 to form an adduct. The shapes of cation and anion in the compound are respectively.
(A) square planar, trigonal bipyramidal
(B) Bent-T-shaped, octahedral
(C) square pyramidal, octahedral
(D) square planar, octahedral

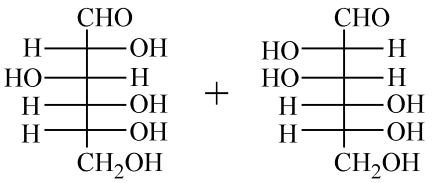
43. (X) $C_4H_7OCl \xrightarrow{NH_3} C_4H_9ON \xrightarrow[KOH]{Br_2}$ $CH_3CH_2CH_2NH_2$. Compound (X) is

(A) 
(B) 
(C) 
(D) 

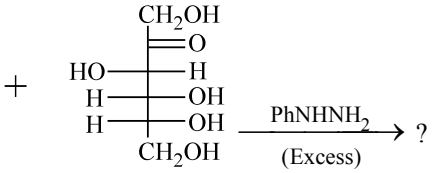
44. How many products are produced respectively when optically pure glucose and fructose are reduced one by one by $NaBH_4$.

(A) 1 & 1 (B) 2 & 2 (C) 1 & 2 (D) 2 & 1

45.



D-Glucose D-Mannose

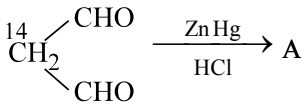


D-Fructose

Total how many type of osazones are obtained in this reaction sequence.

(A) 1 (B) 2 (C) 3 (D) 4

46.

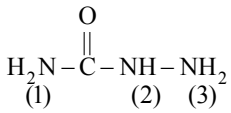


Final major product of this reaction is

(A) $CH_3\overset{14}{C}H_2CH_3$ (B) $\overset{14}{C}H_3CH_2CH_3$

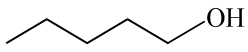
(C) $CH_3\overset{14}{C}H_2-CHO$ (D) $\overset{14}{C}H_3-CH_2-CHO$

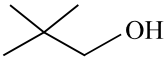
47. Which of the amino group in semi carbazide will react with carbonyl group:

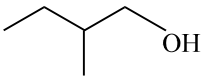


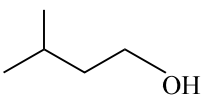
(A) 1 (B) 2 (C) 3 (D) 1 & 3

48. Which of the following alcohols cannot be prepared from an alkene?

(A) 

(B) 

(C) 

(D) 

49. On treatment with Lucas reagent, there is an appearnce of a precipitate at once. This is a:

(A) primary alocohol (B) secondary alcohol

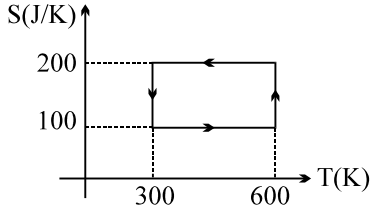
(C) tertiary alcohol (D) none

50. A compound with molecular formula $C_6H_{14}O_4$ does not give litmus test and does not give colour with 2,4–DNP. It reacts with excess MeCOCl to give a compound whose vapour density is 117. Compound A contains how many hydroxy groups?

(A) 1 (B) 2 (C) 3 (D) 4

SECTION-B

51. From the given T-S diagram of a reversible carnot engine, find work delivered by engine in one cycle



52. Two mole of an ideal gas is expanded irreversibly & isothermally at 27°C untill its volume is doubled and 3.3 kJ heat is absorbed from surrounding. Determine ΔS_{system} & $\Delta S_{surrounding}$.

53. Hardness of water sample is due to only dissolved $MgSO_4$. To start precipitation of MgF_2, the concentration of NaF required is just more than 0.02 M. What will be hardness of water sample in ppm of $CaCO_3$

[Given : $K_{sp}(MgF_2)$ at 25°C = 8×10^{-8}]

54. What percentage of acetic acid molecules are unionised in 5×10^{-8}M-CH_3COOH solution at 25°C?

K_a of $CH_3COOH = 1.6 \times 10^{-5}$.(Take $\sqrt{4.25} = 2.06$)

[Fill your answer by multiplying it with 1000, if the answer is 0.235% then fill the same in OMR sheet as 0235]

55. The reaction $A(g) \longrightarrow 2B(g) + C(g)$ is a first order reaction with respect to A, with rate constant 1.386×10^{-3} sec^{-1}. Starting with 0.1 mole/L of gas A, **find the concentration of A** after 500 sec. from the start of reaction when the reaction is allowed to take place at **constant total pressure** at 300 K.

56. 1 gm of an iron ore containing 50% ferrous (Fe^{2+}) and ferric ion (Fe^{3+}) and rest 50% impurities was dissolved in concentrated hydrochloric acid and the filtered solution was raised to 100 ml in flask. 50 ml of the solution were treated with M/10 $K_2Cr_2O_7$, which give titre value of 5 ml. Find the percentage of ferric ion in the ore.

57. Calculate the EMF (in milliVolt) of the cell

$Pt \mid H_2(g) \mid RNH_3Cl\,(aq) \parallel HA\,(aq) \mid H_2\,(g) \mid Pt$

1 bar 0.1 M 0.01 M 0.5 bar

[**Given :** $K_{a(HA)} = 4 \times 10^{-6}$, $K_{b(RNH_2)} = 10^{-5}$, 2.303 $\frac{RT}{F} = 0.06$; $\log 2 = 0.3$]

58. A current of 0.5 amp is passed through excess of molten mixture of Al_2O_3 and Na_3AlF_6 for 9.65 hours. The mass of Al (in mg) deposited at the cathode, with $\frac{1000}{12}$% current efficiency is (Al=27).

59. How many gm of glucose should be dissolved in 500 gm of water in order to produce a solution with 105°C difference between the freezing point and the boiling point ? For water, $K_f = 1.9$ K-Kg/mol and $K_b = 0.6$ K-Kg / mol.

60. In a Li^{2+} ion, electron jumps from an orbital with three radial and two angular nodes to an orbital with one radial and one angular node. The wavelength of radiation emitted out is $\frac{X}{3000\,R}$, where R is the Rydberg constant. The value of '**X**' is

(SECTION-A)

61. Let $y=f(x)$ be a continuous function suchthat $\frac{dy}{dx}=|x-1|$. If $y(0)=0$ then $y(3)$ equals

(A) $\frac{-3}{2}$ (B) $\frac{3}{2}$

(C) $\frac{5}{2}$ (D) 2

62. The equation of a line inclined at an angle $\frac{\pi}{4}$ to the axis of X, such that the two circles $x^2+y^2=4,\ x^2+y^2-10x-14y+65=0$ intercept equal lengths on it, is

(A) $2x-2y-3=0$

(B) $2x-2y+3=0$

(C) $x-y+6=0$

(D) $x-y-6=0$

63. If the line $ax+by=1$ passes through point of intersection of $y=x\tan\alpha+p\sec\alpha$, $y\sin(30^\circ-\alpha)-x\cos(30^\circ-\alpha)=p$ and isinclined at 30° with $y=\tan\alpha x$, then the value of a^2+b^2 can be-

(A) $\frac{1}{p^2}$ (B) $\frac{2}{p^2}$

(C) $\frac{3}{2p^2}$ (D) $\frac{3}{4p^2}$

64. The intercept cut off from y-axis is twice that from x-axis by the line and line is passes through (1, 2) then its equation is-

(A) 2x + y = 4 (B) 2x + y + 4 = 0

(C) 2x –y = 4 (D) 2x – y + 4 = 0

65. If a line is drawn through a fixed point $P(\alpha,\beta)$ to cut the circle $x^2+y^2=a^2$ at A andB, then find the value of PA'PB is

(A) $\alpha^2+\beta^2-a^2$ (B) $\alpha^2-\beta^2+a^2$

(C) $\alpha^2+\beta^2+a^2$ (D) None of these

66. If X and Y are square matrices such that $X=\begin{bmatrix}0&1&-1\\1&2&3\\1&1&2\end{bmatrix}$ and $Y=\begin{bmatrix}-1&-1&1\\1&2&3\\1&1&2\end{bmatrix}$ thenvalue of $\det\left((\text{adj } adj\ \text{adj}\,x)\left(\text{adj}\,y^{-1}\right)\right)$

(A) $\frac{128}{9}$ (B) $-\frac{256}{9}$

(C) $\frac{256}{9}$ (D) $-\frac{128}{9}$

67. Equation of the circle touching the circle $x^2+y^2-15x+5y=0$ at the point $(1,2)$ and passing through the point $(0,2)$ is

(A) $13x^2+13y^2-13x-61y+70=0$

(B) $x^2+y^2+2x=0$

(C) $13x^2+13y^2-13x-61y+9=0$

(D) none of these

68. $\lim\limits_{x\to-\infty}\left\{x+\sqrt{x^2+3x\cos\frac{1}{|x|}}\right\}$ equals

(A) 3 / 2 (B) –3 / 2

(C) -1 (D) None of these

69. If $f(x)=\frac{x^2}{2-2\cos x};g(x)=\frac{x^2}{6x-6\sin x}$ where $0<x<1$, then

(A) both 'f' and 'g' are increasing functions

(B) 'f' is decreasing & 'g' is increasing function

(C) 'f' is increasing & 'g' is decreasing function

(D) both 'f' & 'g' are decreasing function

70. If $\int_0^a\frac{dx}{\sqrt{x+a}+\sqrt{x}}=\int_0^{\pi/8}\frac{2\tan\theta}{\sin 2\theta}d\theta$, then the value of 'a' is equal to $(a>0)$

(A) $\frac{3}{4}$ (B) $\frac{\pi}{4}$

(C) $\frac{3\pi}{4}$ (D) $\frac{9}{16}$

71. The equation of a curve passing through $(2,7/2)$ and having gradient $1-\frac{1}{x^2}$ at (x,y) is

(A) a parabola

(B) $xy=x^2+x+1$

(C) $xy=x^2+2$

(D) None of these

72. Solution of the differential equation $\frac{dy}{dx}=\frac{x+y+7}{2x+2y+3}$ is

(A) $6(x+y)+11\ln(3x+3y+10)=9x+c$

(B) $6(x+y)-11\ln(3x+3y+10)=9x+c$

(C) $6(x+y)-11\ln(x+y+10)-9x=c$

(D) None

(where c is arbitrary constant)

73. The four points whose co-ordinates are (2, 1), (1, 4), (4, 5), (5, 2) form

(A) A rectangle which is not a square

(B) A trapezium which is not a parallelogram

(C) A square

(D) A rhombus which is not a square

74. If $f(x)=\int_{-\pi/2}^{\pi/2}\frac{\sin 2\theta}{\sqrt{1+\sin 2x\sin\theta}}d\theta$, where $\frac{\pi}{4}<x<\frac{\pi}{2}$, then $\int f(x)dx$ is equal to

(A) $-\frac{4}{3}\sec x+c$

(B) $-\frac{4}{3}\ln(\sec x+\tan x)+c$

(C) $\frac{4}{3}\operatorname{cosec} x+c$

(D) $-\frac{4}{3}\ln\left(\tan\frac{x}{2}\right)+c$

75. If a, b, care non – zeros, then the system of equations,

$\alpha x+(\alpha+b)y+\alpha z=0, ax+\alpha y+(\alpha+c)z=0$

has a non-trivial solution if

(A) $\alpha^{-1}=-\left(a^{-1}+b^{-1}+c^{-1}\right)$

(B) $\alpha^{-1}=a+b+c$

(C) $\alpha+a+b+c=1$

(D) None of these

76. The straight line $ax+by+c=0$ where $abc\neq 0$ will pass through the first quadrant if

(A) $ac>0, bc>0$

(B) $ac>0$ and $bc<0$

(C) $bc>0$ and / or $ac>0$

(D) $ac<0$ and / or $bc<0$

77. Let f,g and h be continuous function on [0,a] such that f(x) = f(a–x), g(x) = – g(a–x) and 3h(x) – 4h(a – x) = 5. Then $\int_0^a f(x)$ g(x) h(x) dx =

(A) 5/4 (B) 3/4 (C) 1 (D) 0

78. A variable circle having fixed radius 'a', passes through origin and meets the co-ordinate axes in points A and B. Locus of centroid of triangle OAB, 'O' being the origin is -

(A) $9\left(x^2+y^2\right)=4a^2$

(B) $9\left(x^2+y^2\right)=a^2$

(C) $9\left(x^2+y^2\right)=2a^2$

(D) $9\left(x^2+y^2\right)=8a^2$

79. Let $y'=\frac{4y^2+4xy+x^2}{4x^2}$ and $y(1)=0$,then $y\left(e^{\frac{\pi}{2}}\right)$ equals

(A) $e^{\frac{\pi}{2}}$ (B) $\frac{1}{2}e^{\frac{\pi}{2}}$

(C) $\frac{1}{4}e^{\frac{\pi}{2}}$ (D) None of these

80. If slope of lines represented by $ax^2+2hxy+by^2=0$ are in 1: 3 ratio then h^2 : ab equals -

(A) 3 / 4 (B) 1 / 4 (C) 4 / 3 (D) 1

(SECTION-B)

81. If $\vec{a}$ and $\vec{b}$ are vectors in space given by $\vec{a}-\frac{\hat{i}-2\hat{j}}{\sqrt{5}}$ and $\vec{b}-\frac{2\hat{i}+\hat{j}+3\hat{k}}{\sqrt{14}}$, then the value of $(2\vec{a}+\vec{b})\cdot[(\vec{a}\times\vec{b})\times(\vec{a}-2\vec{b})]$ is

82. If in a $\triangle ABC, \sin^3 A + \sin^3 B + \sin^3 C = 3\sin A \cdot \sin B \cdot \sin C$, then the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

83. Let f(x) = min ({x}, {– x}), where {x} denotes the fractional part of x, then $\int_{-100}^{100} f(x)dx$ is equal to -

84. If $\int \frac{f'(x)g(x) - g'(x)f(x)}{(f(x)+g(x))\sqrt{f(x)g(x) - g^2(x)}}dx$ is equal to $\sqrt{m}\tan^{-1}\left(\sqrt{\frac{f(x)-g(x)}{ng(x)}}\right) + c$, where $m, n \in N$ and 'c' constant of integration $(g(x) > 0)$ then $m^2 + n^2$ is equal to

85. Let x_i, where i = 1, ……n be the roots of n degree polynomial P(x) = x^n – $14x^{n-1}$ + $70x^{n-2}$ + ……. If the standard deviation of all x_i, i = 1, 2, …… n is 2, then find the number of observation

86. For any real number x, let [x] denote the largest integer less than or equal to x. Let f be a real valued function defined on the interval $[-10, 10]$ by $f(x) - \begin{cases} x - [x] & \text{if } [x] \text{ is odd} \\ 1 + [\times] - x & \text{if } [x] \text{ is even} \end{cases}$. Then the value of $\frac{\pi^2}{10}\int_{-10}^{10} f(x)\cos \pi x d(x)$ is

87. If $\left|\frac{Z-1}{Z-4}\right| = 2$ and $\left|\frac{w-4}{w-1}\right| = 2$, then the value of $|z - w|_{max} + |z - w|_{min}$ is -

88. If a+ + b+ + c^2 = 0 and matrix $A = \begin{bmatrix} b^2 + c^2 & ab & ac \\ ab & c^2 + a^2 & bc \\ ac & bc & a^2 + b^2 \end{bmatrix}$ and if |adj(adjA)| = $32\lambda a^8 b^8 c^8$, (a, b, c ≠ 0), then λ =

89. Let [t] denote the greatest integer ≤ t. If for some $\lambda \in R - \{0, 1\}$, $\lim_{x \to 0} \left|\frac{1 - x + |x|}{\lambda - x + [x]}\right| = L$ then L isequal to

90. If the surface area of a cube in increasing at a rateof 3.6 cm^2/sec, retaining its shape; then the rateof change of its volume (in cm^3/sec), when thelength of a side of the cube is 10cm, is