Sky Tutorials

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IIT-JEE | NEET | Foundation

JEE

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

ALL INDIA SKY TEST SERIES

XI – IIT JEE (SAMARATH BATCH)

Date: 05/11/2023

SYLLABUS

PHYSICS	CHEMISTRY	MATHEMATICS
Previous + Centre of Mass	**Equilibrium + Chemical bonding**	**Previous + Binomial theorem**

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

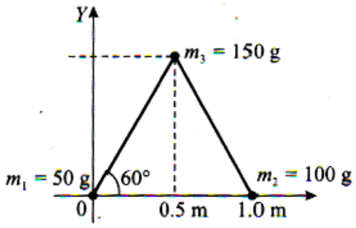
Section - A

Single Choice Question

1. Distance of the centre of mass of a solid uniform cone from its vertex is z_0. If the radius of its base is R and its height is h then z_0 is equal to

(a) $\frac{h^2}{4R}$ (b) $\frac{3h}{4}$ (c) $\frac{5h}{8}$ (d) $\frac{3h^2}{8R}$

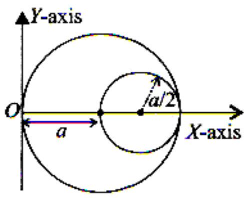
2. Three particles of masses 50 g, 100 g and 150 g are placed at the vertices of an equilateral triangle of side 1 m (as shown in the figure). The (x, y) coordinates of the centre of mass will be



(a) $\left(\frac{7}{12}m, \frac{\sqrt{3}}{8}m\right)$ (b) $\left(\frac{\sqrt{3}}{4}m, \frac{5}{12}m\right)$

(c) $\left(\frac{7}{12}m, \frac{\sqrt{3}}{4}m\right)$ (d) $\left(\frac{\sqrt{3}}{8}m, \frac{7}{12}m\right)$

3. A circular hole of radius $\left(\frac{a}{2}\right)$ is cut out of a circular disc of radius 'a' as shown in figure. The centroid of the remaining circular portion with respect to point 'O' will be



(a) $\frac{1}{6}a$ (b) $\frac{10}{11}a$ (c) $\frac{5}{6}a$ (d) $\frac{2}{3}a$

4. Two bodies of mass 1 kg and 3 kg have position vectors $\hat{i}+2\hat{j}+\hat{k}$ and $-3\hat{i}-2\hat{j}+\hat{k}$ respectively. The magnitude of position vector of centre of mass of this system will be similar to the magnitude of vector

(a) $\hat{i}-2\hat{j}+\hat{k}$ (b) $-3\hat{i}-2\hat{j}+\hat{k}$

(c) $-2\hat{j}+2\hat{k}$ (d) $-2\hat{i}-\hat{j}+2\hat{k}$

5. Two blocks of masses 10 kg and 30 kg are placed on the same straight line with coordinates (0, 0) cm and (x, 0) cm respectively. The block of 10 kg is moved on the same line through a distance of 6 cm towards the other block. The distance through which the block of 30 kg must be moved to keep the position of centre of mass of the system unchanged is

(a) 4 cm towards the 10 kg block
(b) 2 cm away from the 10 kg block
(c) 2 cm towards the 10 kg block
(d) 4 cm away from the 10 kg block

6. A man (mass = 50 kg) and his son (mass = 20 kg) are standing on a frictionless surface facing each other. The man pushes his son so that he starts moving at a speed of 0.70 ms^{-1} with respect to the man. The speed of the man with respect to the surface is

(a) 0.20 ms^{-1} (b) 0.14 ms^{-1}
(c) 0.47 ms^{-1} (d) 0.28 ms^{-1}

7. A body of mass M at rest explodes into three pieces, in the ratio of masses 1 : 1 : 2. Two smaller pieces fly off perpendicular to each other with velocities of 30 ms^{-1} and 40 ms^{-1} respectively. The velocity of the third piece will be

(a) 15 ms^{-1} (b) 25 ms^{-1} (c) 35 ms^{-1} (d) 50 ms^{-1}

8. A particle of mass m is fixed to one end of a light spring having force constant k and unstretched length is l. The other end is fixed. The system is given an angular speed ω about the fixed end of the spring such that it rotates in a circle in gravity free space. Then the stretch in the spring is

(a) $\frac{ml\omega^2}{k+m\omega^2}$ (b) $\frac{ml\omega^2}{k-m\omega^2}$

(c) $\frac{ml\omega^2}{k-\omega m}$ (d) $\frac{ml\omega^2}{k+\omega m}$

9. The position vector of a particle related to time t is given by $\hat{r}=(10t\,\hat{i}+15t\,\hat{j}+7\hat{k})m$

The direction of net force experienced by the particle is

(a) Positive y-axis (b) Positive x-axis
(c) Positive z-axs (d) In x-y plane

10. Two projectiles are thrown with same initial velocity making an angle of 45^o and 30^o with the horizontal respectively. The ratio of their respective ranges will be
(a) $1:\sqrt{2}$ (b) $\sqrt{2}:1$ (c) $2:\sqrt{3}$ (d) $\sqrt{3}:2$

11. The initial speed of a projectile fired from ground is u. At the highest point during its motion, the speed of projectile is $\frac{\sqrt{3}}{2}u$. The time of flight of the projectile is
(a) $\frac{u}{2g}$ (b) $\frac{u}{g}$ (c) $\frac{2u}{g}$ (d) $\frac{\sqrt{3}u}{g}$

12. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (vertically). If the acceleration of the system is g/8, then the ratio of masses is :
(a) 8 : 1 (b) 9 : 7 (c) 4 : 3 (d) 5 : 3

13. A solid hemisphere and a solid cone have a common base. The center of mass of common structure coincides with the common base. If R is the radius of hemisphere and h is the height of the cone, then h/R will be
(a) $\sqrt{3}$ (b) 3 (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{3}$

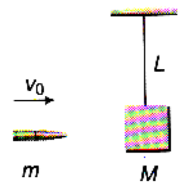
14. Which of the following is true for center of mass?
(i) The center of mass of a body may lie within, outside, on the surface of the body.
(ii) In the case of symmetrical bodies, the center of mass coincides with the geometrical center of the body.
(iii) In the absence of external forces, the center of mass moves with constant velocity.
(iv) If external forces are absent and system is initially at rest, then location of center of mass is fixed.
(a) (i), (ii) (b) (i), (ii), (iii)
(c) (ii), (iii), (iv) (d) all options are correct

15. A pulley fixed to the ceiling carries a string with blocks of mass m and 3m attached to its ends. The masses of string and pulley are negligible. When the system is released, its center of mass moves with what acceleration
(a) 0 (b) g/4 (c) g/2 (d) –g/2

16. A shell is fired from a cannon wit velocity v m/s at an angle θ with the horizontal direction. At the highest point in its path it explodes into two pieces of equal mass. One of the pieces retraces its path to the cannon and the speed in m/s of the other piece immediately after the explosion is
(a) 3v cos θ (b) 2v cos θ
(c) $\frac{3}{2}v\cos\theta$ (d) $\frac{\sqrt{3}}{2}v\cos\theta$

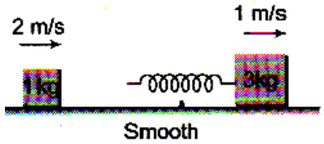
17. A man is standing at the center of frictionless pond of ice. How can he get himself to the shore?
(a) By throwing his shirt in vertically upward direction
(b) By spitting horizontally
(c) He will wait for the ice to melt in pond
(d) Unable to get at the shore

18. Consider the situation as shown in the diagram. The bullet penetrates the block and emerges with speed $v_0/3$. If after collision, the string becomes horizontal, v_0 will be



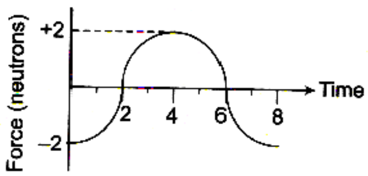
(a) $\frac{m}{M}\sqrt{2gL}$ (b) $\frac{2}{3}\frac{m}{M}\sqrt{2gL}$
(c) $\frac{3}{2}\frac{M}{m}\sqrt{2gL}$ (d) $\frac{M}{m}\sqrt{2gL}$

19. Two blocks of masses 1 kg and 3 kg are moving with velocities 2 m/s and 1 m/s, respectively, as shown. If the spring constant is 75 N/m, the maximum compression of the spring is



(a) 5 cm (b) 10 cm
(c) 15 cm (d) 20 cm

20. A force-time graph for a linear motion is shown in the figure where the segments are circular. The linear momentum gained between zero and 8 s is



(a) -2π N-s (b) Zero
(c) -4π N-s (d) -6π N-s

Section - B

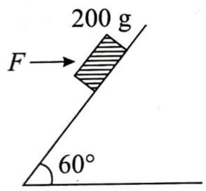
Integer Type Questions

21. The position of the centre of mass of a uniform semi-circular wire of radius 'R' placed in x-y plane with its center at the origin and the line joining its ends as x-axis by $\left(0, \frac{xR}{\pi}\right)$. Then, the value of $|x|$ is ________.

22. The distance of centre of mass from end A of a one dimensional rod (AB) having mass density $\rho = \rho_0\left(1 - \frac{x^2}{L^2}\right)$ kg/m and length L (in meter) is $\frac{3L}{\alpha}$ m. The value of α is ________ (where x is the distance from end A)

23. A stone tied to a string of length L is whirled in a vertical circle with the other end of the string at the centre. At a certain instant of time, the stone is at its lowest position and has a speed u. The magnitude of change in its velocity it reaches a position where the string is horizontal, is $\sqrt{x(u^2 - gL)}$. The value of x is

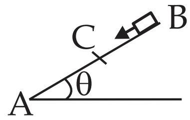
24. A block of mass 200 g is kept stationary on a smooth inclined plane by applying a minimum horizontal force $F = \sqrt{x}N$ as shown in figure. The value of x = __________.



25. A block of mass 10 kg is moving along x-axis under the action of force $F = 5x\,N$. The work done by the force in moving the block from x = 2 m to 4 m will be…………J

26. Two persons A and B perform same amount of work in moving a body through a certain distance d with application of forces acting at angle 45° and 60° with the direction of displacement respectively. The ratio of force applied by person A to the force applied by person B is $\frac{1}{\sqrt{x}}$. The value of x is ___________.

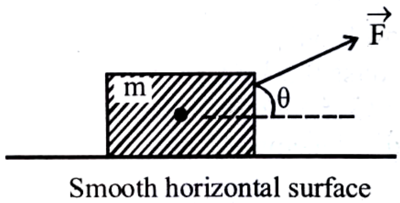
27.



A small block starts slipping down from a point B on an inclined plane AB, which is making an angle θ with the horizontal section BC is smooth and the remaining section CA is rough with a coefficient of friction μ. It is found that the block comes to rest as it reaches the bottom (point A) of the inclined plane. If BC = 2AC, the coefficient of friction is given by $\mu = k\tan\theta$. The value of k is ___________.

28. A body of mass 5 kg is moving with a momentum of 10 kg ms^{-1}. Now a force of 2 N acts on the body in the direction of its motion for 5 s. The increase in the kinetic energy of the body is _______J.

29. An object of mass 'm' initially at rest on smooth horizontal plane starts moving under the action of force F = 2N. In the process of its linear motion, the angle θ (as shown in figure) between the direction of force and horizontal varies as $\theta = kx$, where k is a constant and x is the distance covered by the object from its initial position. The expression of kinetic energy of the object will the $E = \frac{n}{k}\sin\theta$. The value of n is ________.



30. A uniform chain of length 3 meter and mass 3 kg overhangs a smooth table with 2 meter laying on the table. If k is the kinetic energy of the chain in joule as it completely slips off the table, then the value of k is __________.
(Take g = 10 m/s^2)

CHEMISTRY

SECTION - A

Single Choice Question

31. The decomposition of N_2O_4 to NO_2 was carried out in chloroform at $280^\circ C$. At equilibrium, 0.2 mol of N_2O_4 and 2×10^{-3} mole of NO_2 were present in 2L of solution. The equilibrium constant (K_c) for the reaction $N_2O_4 \rightleftharpoons 2NO_2$ is
(a) 0.01×10^{-3} (b) 2.0×10^{-3}
(c) 2.0×10^{-5} (d) 0.01×10^{-5}

32. The value of K_P for the reaction.
$2H_2O(g)+2Cl_2(g) \rightleftharpoons 4HCl(g)+O_2(g)$ is 0.03 atm at 427°C, when the partial pressure are expressed in atmosphere, then the value of K_c for the same reaction is :
(a) 5.23×10^{-4} (b) 7.34×10^{-4}
(c) 3.2×10^{-3} (d) 5.43×10^{-5}

33. Ammonium hydrogen sulphide dissociates according to the equation
$NH_4HS(s) \rightleftharpoons NH_3(g)+H_2S(g)$
The total pressure at equilibrium at 400 K is found to be 1 atm.
The equilibrium constant K_P of the reaction is :
(a) 1 atm^2 (b) 0.25 atm^2
(c) 0.5 atm (d) 0.25 atm

34. $2AB_2(g) \rightleftharpoons 2AB(g)+B_2(g)$
Degree of dissociation of AB_2 is x. What will be equation for x in terms K_P and equilibrium pressure P ?
(a) $K_P = \frac{x^3}{(2+x)(1-x)^2}\times P$
(b) $x = \sqrt[3]{\frac{P}{2K_P}}$
(c) $x = \sqrt{\frac{2K_p}{P}}$
(d) $K_p = \frac{x^2}{(2+x)(1-x)}\times P$

35. PCl_5 decomposes at $PCl_5(g) \rightleftharpoons PCl_3(g)+Cl_2(g)$. If at equilibrium, total pressure is P and density of gaseous mixture is d at temperature T then degree of dissociation (α) is :
(a) $\alpha = 1-\frac{PM}{dRT}$ (b) $\alpha = 1-\frac{dRT}{PM}$
(c) $\alpha = \frac{PM}{dRT}-1$ (d) $\alpha = \frac{dRT}{PM}-1$

36. In the following reaction :
$HC_2O_4^- + PO_4^{3-} \rightleftharpoons HPO_4^{2-} + C_2O_4^{2-}$
Which are the two Bronsted bases ?
(a) $HC_2O_4^-$ and PO_4^{3-} (b) HPO_4^{2-} and $C_2O_4^{2-}$
(c) $HC_2O_4^-$ and HPO_4^{2-} (d) PO_4^{3-} and $C_2O_4^{2-}$

37. 400 mL of $\frac{1}{200}$ M H_2SO_4, 400 mL of $\frac{1}{100}$ M HCl and 200 mL water are mixed together, pH of the resulting solution is A:
(a) 2.1 (b) 2.8 (c) 3 (d) 3.1

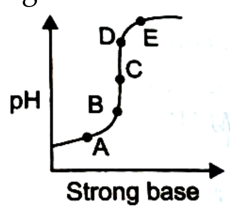
38. Calculate pH of 0.1 M H_2S solution :
{Given : $K_{a_1} = 10^{-7}$ and $Ka_2 = 10^{-14}$)
(a) 3 (b) 7
(c) 4 (d) None of these

39. Ammonium cyanide is salt of NH_4OH ($K_b = 1.8\times10^{-5}$) and HCN ($K_a = 4.0\times10^{-10}$). The hydrolysis constant of 0.1 M NH_4 CN at 25°C is :
(a) 1.4 (b) 7.2×10^{-15}
(c) 7.2×10^{-5} (d) 1.6×10^{-6}

40. Equal volume of 0.2 M NH_4OH and 0.1 M H_2SO_4 are mixed. Calculate pH of final solution
(Given : $K_{b_{NH_3}} = 1.8\times10^{-5}$)
(a) 5.13 (b) 6.24 (c) 7.2 (d) 5.5

41. For preparing a buffer solution of pH = 5 by mixing sodium acetate and acetic acid, the ratio of the concentration of salt and acid should be ($K_a = 10^{-5}$) :
(a) 1 : 10 (b) 1 : 1 (c) 10 : 1 (d) 1 : 100

42. At which point in the graph concentration of weak acid and it's conjugate becomes equal in solution during the titration of weak acid (HA) with strong base :



(a) A (b) B (c) C (d) D

43. Calculate buffer capacity of 1 litre of a mixture of 0.1 M CH_3COOH and 0.1 M CH_3COONa. (Given : $pK_{aCH_3COOH} = 4.74$)

(a) 2.303×0.05 (b) 0.1×2.303
(c) 1×2.303 (d) None of these

44. What fraction of an indicator Hln is in the basic form at a pH of 6 if the pK_a of the indicator is 5 ?

(a) $\frac{1}{2}$ (b) $\frac{1}{11}$ (c) $\frac{10}{11}$ (d) $\frac{1}{10}$

45. The solubility product of AgCl is 1.8×10^{-10}. Precipitation of AgCl will occur only when equal volumes of solutions of :

(a) 10^{-4} M Ag^+ and 10^{-4} M Cl^- are mixed
(b) 10^{-7} M Ag^+ and 10^{-7} M Cl^- are mixed
(c) 10^{-5} M Ag^+ and 10^{-5} M Cl^- are mixed
(d) 10^{-10} M Ag^+ and 10^{-10} M Cl^- are mixed

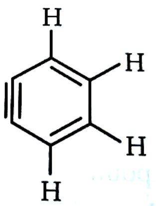
46. Arrange in increasing order of solubility of AgBr in solutions given :

(i) 0.1 M NH_3 (ii) 0.1 M $AgNO_3$
(iii) 0.2 M NaBr (iv) pure water

(a) (iii) < (ii) < (iv) < (i)
(b) (iii) < (ii) < (i) < (iv)
(c) (iii) < (ii) = (i) < (iv)
(d) (ii) < (iii) < (iv) < (i)

47. How many sp^2 and sp-hybridised carbon atoms are present respectively in the following compound ?

Benzyne molecule



(a) 4, 2 (b) 6, 0 (c) 3, 3 (d) 5, 1

48. Respective order of strength of back bonding and Lewis acidic strength in boron trihalides is :

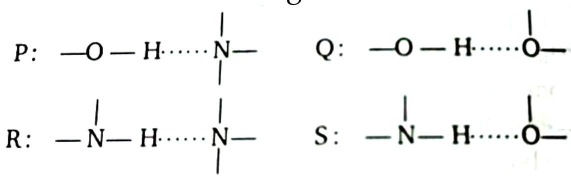
(a) $BF_3 < BCl_3 < BBr_3$ and $BF_3 < BCl_3 < BBr_3$
(b) $BF_3 > BCl_3 > BBr_3$ and $BF_3 > BCl_3 > BBr_3$
(c) $BF_3 > BCl_3 > BBr_3$ and $BF_3 < BCl_3 < BBr_3$
(d) $BF_3 < BCl_3 < BBr_3$ and $BF_3 > BCl_3 > BBr_3$

49. Identify the correct match.

(i)	XeF_2	(A)	Central atom has sp^3 hybridisation and bent geometry.
(ii)	N_3^-	(B)	Central atom has sp^3d^2 hybridisation and octahedral.
(iii)	$PC_6^-(PCl_5$ (s)anion)	(C)	Central atom has sp hybridization and linear geometry.
(iv)	$ICl_2^+(I_2Cl_6$ (l) catio)	D	Central atom ahs sp^3d hybridization and linear geometry.

(a) (i-A), (ii-B), (iii)-(C), (iv-D)
(b) (i-D), (ii-B), (iii-D), (iv-C)
(c) (i-B), (ii-C), (iii-A), (iv-D)
(d) (i-D), (ii-C), (iii-B), (iv-A)

50. Consider the following sets of H-bonds



The correct order of H-bond strengths is :

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

SECTION - B

Integer Type Questions

51. What is the minimum p^H necessary to cause precipitation of $Pb(OH)_2(K_{sp} = 1.2 \times 10^{-5})$ to form in a 0.12 M $PbCl_2$ solution ?

52. On litre of a buffer solution containing 0.01 M NH_4Cl and 0.1 M NH_4OH having pK_b of 5 has p^H of :

53. Calculate the p^H of an aqueous solution of 1.0 M ammonium acetate assuming complete dissociation. (pK_a of acetic acid = 4.8 and pK_b of ammonia = 4.80)

54. A certain buffer solution contains equal concentration of CN^- and HCN. The K_b of CN^- is 10^{-10}. The p^H of buffer solution is :

55. 10 mL solution of a weak base BOH (0.2M) is mixed with 10 mL solution of HCl (0.2M). the pH of resulting solution is found to be 5. What is the value of pK_a of B^+ ion.

56. Among the triatomic molecules/ions, $BeCl_2$, N_3^-, N_2O, NO_2^+, O_3, SCl_2, ICl_2^-, I_3^- and XeF_2, the total number of linear molecules (s)/ions(s) where the hybridization of the central atom does not have contribution from the d-orbital(s).

57. How many of the following have bond order less than two ?
$NO_3^-, CO_3^{2-}, F_2, Cl_2, Br_2, O_2^{2-}, O_2^-, N_2^-, O_2^{2+}, Li_2^+, He_2^+$

58. In which of the following all bond length are non equal
$PCl_5, SF_4, ClF_3, XeF_2, [SF_5]^+, [ClF_4]^+, [XeF_3]^+, O_3, P_4$ (white)

59. X is the number of maximum atom (s) is/are present in same plane of $B_3N_3H_6$. Find value of $\frac{X}{2}$.

60. Total number of lone pairs on I_3^+ and N_2O_3 is and their sum.

MATHEMATICS

Section - A

Single Choice Question

61. The real roots of the equation $x^2+5|x|+4=0$ are
(a) $\{-1,-4\}$ (b) $\{1,4\}$
(c) $\{-4,4\}$ (d) None of these

62. If $|x^2-x-6|=x+2$, then the values of x are
(a) $-2,2,-4$ (b) $-2,2,4$
(c) $3,2,-2$ (d) $4,4,3$

63. The some of all real roots of the equation $|x-2|^2+|x-2|-2=0$ is
(a) 2 (b) 4 (c) 1 (d) N.O.T.

64. The number of real solutions of the equation $|x^2+4x+3|+2x+5=0$ are
(a) 1 (b) 2 (c) 3 (d) 4

65. The number of real roots of the equation $e^{\sin x}-e^{-\sin x}-4=0$ are
(a) 1 (b) 2
(c) Infinite (d) None of these

66. The equation $x^2-6x+8+\lambda(x^2-4x+3)=0$, $\lambda\in R$, has
(a) Real and unequal roots for all λ
(b) Real roots for $\lambda<0$ only
(c) Real roots for $\lambda>0$ only
(d) Real and unequal roots for $\lambda=0$ only

67. If α and β are roots of $ax^2+2bx+c=0$, then $\sqrt{\frac{\alpha}{\beta}}+\sqrt{\frac{\beta}{\alpha}}$ is equal to
(a) $\frac{2b}{ac}$ (b) $\frac{2b}{\sqrt{ac}}$ (c) $\frac{2b}{\sqrt{ac}}$ (d) $-\frac{b}{\sqrt{2}}$

68. If α, β are the roots of $x^2-3x+1=0$, then the equation whose roots are $\frac{1}{\alpha-2},\frac{1}{\beta-2}$ is
(a) $x^2+x-1=0$ (b) $x^2+x+1=0$
(c) $x^2-x-1=0$ (d) None of these

69. Given that $\tan\alpha$ and $\tan\beta$ are the roots of $x^2-px+q=0$, then the value of $\sin^2(\alpha+\beta)=$
(a) $\frac{p^2}{p^2+(1-q)^2}$ (b) $\frac{p^2}{p^2+q^2}$
(c) $\frac{q^2}{p^2+(1-q)^2}$ (d) $\frac{p^2}{(p+q)^2}$

70. If the sum of the roots of the equation $x^2+px+q=0$ is three times their difference, then which one of the following is true
(a) $9p^2=2q$ (b) $2q^2=9p$
(c) $2p^2=9q$ (d) $9q^2=2p$

71. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}$ are equal in magnitude but opposite in sign, then the product of the roots will be
(a) $\frac{p^2+q^2}{2}$ (b) $-\frac{(p^2+q^2)}{2}$
(c) $\frac{p^2-q^2}{2}$ (d) $-\frac{(p^2-q^2)}{2}$

72. The roots of the equation $x^2-2x+A=0$ are p, q and the roots of the equation $x^2-18x+B=0$ are r, s. If $p<q<r<s$ are in A.P., then
(a) $A=3, B=77$ (b) $A=-3, B=77$
(c) $A=3, B=-77$ (d) $A=-3, B=-77$

73. The interior angles of a polygon are in A.P. If the smallest angle be 120° and the common difference be 5, then the number of sides is
(a) 8 (b) 10 (c) 9 (d) 6

74. The first term of a G.P. is 7, the last term is 448 and sum of all terms is 889, then the common ratio is
(a) 5 (b) 4 (c) 3 (d) 2

75. Consider an infinite G.P. with first term a and common ratio r, its sum is 4 and the second term is 3/4 , then
(a) $a=\frac{7}{4}, r=\frac{3}{7}$ (b) $a=\frac{3}{2}, r=\frac{1}{2}$
(c) $a=2, r=\frac{3}{8}$ (d) $a=3, r=\frac{1}{4}$

76. If $x+iy=\frac{3}{2+\cos\theta+i\sin\theta}$, then x^2+y^2 is equal to
(a) $3x-4$ (b) $4x-3$
(c) $4x+3$ (d) None of these

77. For any two complex numbers z_1 and z_2 and any real numbers a and b; $|(az_1-bz_2)|^2+|(bz_1+az_2)|^2=$
(a) $(a^2+b^2)(|z_1|+|z_2|)$
(b) $(a^2+b^2)(|z_1|^2+|z_2|^2)$
(c) $(a^2+b^2)(|z_1|^2-|z_2|^2)$
(d) None of these

78. The number of values of θ in $[0, 2\pi]$ satisfying the equation $2\sin^2\theta=4+3\cos\theta$ are
(a) 0 (b) 1 (c) 2 (d) 3

79. If $\cos\theta=-\frac{1}{\sqrt{2}}$ and $\tan\theta=1$, then the general value of θ is
(a) $2n\pi+\frac{\pi}{4}$ (b) $(2n+1)\pi+\frac{\pi}{4}$
(c) $n\pi+\frac{\pi}{4}$ (d) $n\pi\pm\frac{\pi}{4}$

80. If $(1-\tan\theta)(1+\tan\theta)\sec^2\theta+2^{\tan^2\theta}=0$ then in the interval $\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$, the value of θ is
(a) $\frac{\pi}{4}$ (b) $\frac{-\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{-\pi}{3}$

Section - B

Integer Type Questions

81. If $\left(\frac{1+i}{1-i}\right)^{\frac{m}{2}}=\left(\frac{1+i}{i-1}\right)^{\frac{n}{3}}=1, (m,n\in N)$ then the greatest common divisor of the least values of m and n is _______.

82. If $|z+4|\le 3$, then the maximum value of $|z+1|$ is

83. The product of three consecutive terms of a G.P. is 512. If 4 is added to each of the first and the second of these terms, the three terms now form an A.P. Then the sum of the original three terms of the given G.P. is

84. Let $a_1, a_2, a_3, \ldots\ldots\ldots, a_{49}$ be in A.P. such that $\sum_{k=0}^{12} a_{4k+1}=416$ and $a_9+a_{43}=66.$
$a_1^2+a_2^2+\ldots\ldots+a_{17}^2=140m$, then m is equal to

85. Let $\lambda\ne 0$ be in R. If α and β are the roots of the equation, $x^2-x+2\lambda=0$ and α and γ are the roots of the equation, $3x^2-10x+27\lambda=0$, then $\frac{\beta\gamma}{\lambda}$ is equal to

86. Let a, b $\in$R, $a\ne 0$ be such that the equation, $ax^2-2bx+5=0$ has a repeated root α, which is also a root of the equation, $x^2-2bx-10=0$. If β is the other root of this equation, then $\alpha^2+\beta^2$ is equal to

87. The quadratic equations $x^2-6x+a=0$ and $x^2-cx+6=0$ have one root in common. The other roots of the first and second equations are integers in the ratio 4 : 3. Then the common root is

88. Let α and β be the roots of $x^2-6x-2=0$. If $a_n=a^n-\beta^n$ for $n\ge 1$, then the value of $\frac{a_{10}-2a_8}{3a_9}$ is

89. If α and β be the roots of the equation $x^2-2x+2=0$, then the least value of n for $\left(\frac{\alpha}{\beta}\right)^n=1$ is

90. The number of integral values of m for which the quadratic expression, $(1+2m)x^2-2(1+3m)x+4(1+m)$, $x\in R$, is always positive is