JEE-ADVANCED-2012-P1-Model

Time: 3:00 Hrs. **IMPORTANT INSTRUCTIONS** **Max Marks: 210**

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 10)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 11 – 15)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 16 – 20)	Questions with Integer Answer Type	4	0	5	20
Total				**20**	**70**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 21 – 30)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 31 – 35)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 36 – 40)	Questions with Integer Answer Type	4	0	5	20
Total				**20**	**70**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 41 – 50)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 51 – 55)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 56 – 60)	Questions with Integer Answer Type	4	0	5	20
Total				**20**	**70**

MATHEMATICS **Max.Marks:70**

SECTION – I

(SINGLE CORRECT CHOICE TYPE)

This section contains 10 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct

41. For $x, y, z, t \in R$, $\sin^{-1} x + \cos^{-1} y + \sec^{-1} z \geq t^2 - \sqrt{2\pi}\, t + 3\pi$ The value of $x + y + z$ is equal to

A) 1 B) 0 C) 2 D) -1

42. If the sides of a triangle are in A.P, and its greatest angle exceeds the least angle by α, then the sides are in the ratio $1+x : 1 : 1-x$ where $x = \sqrt{\frac{a-\cos\alpha}{b-\cos\alpha}}$, then $a + b =$

A) 6 B) 7 C) 8 D) 9

43. If $x = \cos ec\left(\tan^{-1}\left(\cos\left(\cot^{-1}\left(\sec\left(\sin^{-1} a\right)\right)\right)\right)\right)$ and $y = \sec\left(\cot^{-1}\left(\sin\left(\tan^{-1}\left(\cos ec\left(\cos^{-1} a\right)\right)\right)\right)\right)$ Where $a \in [0,1]$ then relation between x and y is

A) $x + y = 0$ B) $x = 2y$ C) $x = y$ D) $x^2 = y$

44. $\cos^{-1}\left\{\frac{1}{2}x^2+\sqrt{1-x^2}.\sqrt{1-\frac{x^2}{4}}\right\}=\cos^{-1}\frac{x}{2}-\cos^{-1}x$ Holds for

A) $|x|\le 1$ B) $x\in R$ C) $0\le x\le 1$ D) $-1\le x\le 0$

45. Triangle ABC is inscribed in a unit circle, such that three internal angle bisectors of A, B, C are extended to intersect the circumcircle at P, Q, R respectively. Let us denote area $(\Delta ABC)=\Delta_1$ and area $(\Delta PQR)=\Delta_2$

The maximum value of $AP\cos\frac{A}{2}+BQ\cos\frac{B}{2}+CR\cos\frac{C}{2}$ is

A) $\sqrt{3}$ B) $3\sqrt{3}$ C) $2\sqrt{3}$ D) $\frac{5\sqrt{3}}{2}$

46. In a right ΔABC, right angled at C. CA = b & CB = a. CH is altitude from C to AB where H is on AB. AM is the median through A to side BC where M is on BC. Then area of ΔBMH

A) $\frac{a^3b}{a^2+b^2}$ B) $\frac{a^3b}{2\left(a^2+b^2\right)}$ C) $\frac{ab^3}{2\left(a^2+b^2\right)}$ D) $\frac{a^3b}{4\left(a^2+b^2\right)}$

47. In a ΔABC D is the foot of perpendicular from A on BC. If E,F are feet of perpendicular from D on AC and AB respectively , then $\frac{\Delta}{EF}$ is equal to (where Δbe the area of the ΔABC)

A) 4R B) 2R C) R D) R/2

48. If the median AM, angle bisector AD and altitude AH drawn from vertex A of a ΔABC divide angle A into four equal parts and D lies in between H and M, then

A) $\angle A = \frac{\pi}{3}$ B) $\angle A = 90^0$ C) $\frac{AC}{AB} = \sqrt{3} - 1$ D) $\frac{AC}{AB} = \frac{1}{\sqrt{2} - 2}$

49. In a scalene acute angled triangle ΔABC, the line joining circumcentre and orthocentre is parallel to the side BC, then $\angle A \in$

A) $\left(0, \frac{\pi}{6}\right)$ B) $\left(\frac{\pi}{6}, \frac{\pi}{3}\right)$ C) $\left(\frac{\pi}{6}, \frac{\pi}{4}\right)$ D) $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$

50. In triangle ABC, with usual notation, the value of $\left(\frac{a+b+c}{r_1+r_2+r_3}\right)\left(\frac{a}{r_1}+\frac{b}{r_2}+\frac{c}{r_3}\right)$ is less than

A) 2 B) 3 C) 4 D) 5

SECTION – II

(MULTIPLE CORRECT CHOICE TYPE)

This section contains 5 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE** is/ are correct

51. Which of the following is / are true

A) The equation $\sin^{-1}(|\cos x|)-\cos^{-1}(|\sin x|)=$ a, has at least one solution for one integral value a.

B) The equation $\sin^{-1}(|\cos x|)-\cos^{-1}(|\sin x|)=$ a, has at least one solution iff $a\in(0,\pi)$

C) If $\sin^{-1}(x-1)+\cos^{-1}(x-3)+\tan^{-1}\left(\frac{x}{2-x^2}\right)=\cos^{-1}k+\pi$, then the value of $K=\frac{1}{\sqrt{2}}$

D) α_1 and α_2 satisfies $\sin^{-1}\left(\frac{2x}{1+x^2}\right)=\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ and $|\alpha_1-\alpha_2|<K$, for all α_1 and α_2 $(K\in I)$, then minimum value of k is equal to 2

52. In a triangle ABC, the measure of angle A is 75^0 and the measure of angle B is 45^0 and D is a point on the side BC, such that AD = 4 then which of the following is/are false.

A) If AD is the altitude then area of the triangle ABC is $8(3-\sqrt{3})$

B) If AD is the angular bisector, then area of the triangle ABC is $2(3+\sqrt{3})$

C) If AD is the median and $\angle ADB = \theta$ then the value of $\tan\theta$ is $2(1+\sqrt{3})$

D) If AD is the median, and $\angle ADB = \theta$ then the value of $\tan\theta$ is $(1+\sqrt{3})$

53. In a variable ΔABC, the base BC is fixed and $\angle BAC = \alpha$ (a constant)

A) The locus of centroid of ΔABC lies on a circle

B) The locus of incentre of ΔABC lies on a circle

C) The locus of ortho–centre of ΔABC lies on a circle

D) The locus of ex-centre opposite to $'A'$ lies on a circle

54. If in a ΔABC, $\sin C + \cos C + \sin(2B + C) - \cos(2B + C) = 2\sqrt{2}$, then ΔABC is

A) Equilateral B) isosceles

C) right angled D) obtuse angled

55. If $1 + \left[\sin^{-1} x\right] > \left[\cos^{-1} x\right]$ then ([x] denotes greatest integer function)

A) $x \in (\cos 1, \sin 1)$ B) $x \in [\sin 1, 1]$

C) $x \in (\cos 2, 0)$ D) $x \in (\cos 1, 1]$

SECTION –III

(INTEGER ANSWER TYPE)

This section contains 5 questions . The answer to each of the questions is a single digit integer, ranging from **0 to 9.** The appropriate bubbles below the respective question numbers in the ORS have to be darkened.

56. If the sum of the series $\cot^{-1} 2 + \cot^{-1} 8 + \cot^{-1} 18 + \ldots + \cot^{-1} 2n^2 + \ldots\ldots$ upto ∞ is $\frac{k\pi}{4}$ then the value of k is

57. In the ΔABC, a similar $\Delta A'B'C'$ is inscribed so that A^1 lies on BC, B^1 lies on CA, C^1 lies on AB and $B'C' = \lambda BC$. If $B'C'$ is inclined at an angle θ with BC, than $2\lambda\cos\theta$ _____

58. If the circumcentre of ΔABC lies on incircle then cosA + cosB + cosC = $\sqrt{k}$; then the numerical quantity k should be

59. If $\sin^{-1} x \in \left(0, \frac{\pi}{2}\right)$, then value of $\tan\left(\frac{\cos^{-1}\left(\sin\left(\cos^{-1} x\right)\right) + \sin^{-1}\left(\cos\left(\sin^{-1} x\right)\right)}{2}\right)$ is

60. Number of triangles to which an acute angle triangle ABC can act as a pedal triangle is