JEE-ADVANCED-2013-P1-Model

Time:09:00 A.M to 12:00 Noon **IMPORTANT INSTRUCTIONS** Max Marks: 180

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 10)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 11 – 15)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 16 – 20)	Questions with Integer Answer Type	4	-1	5	20
Total				**20**	**60**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 21 – 30)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 31 – 35)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 36 – 40)	Questions with Integer Answer Type	4	-1	5	20
Total				**20**	**60**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 41 – 50)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 51 – 55)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 56 – 60)	Questions with Integer Answer Type	4	-1	5	20
Total				**20**	**60**

MATHEMATICS: Max.Marks : 60

SECTION I

Single Correct Answer Type

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

41. The numbers $a_1, a_2, a_3, ... a_n$ form an A.P such that $a_t = s; a_s = t$ and b_n represents the sum of first n terms of another A.P. such that $b_t = s; b_s = t$ for a fixed pair of distinct natural numbers t and s. Then for a given natural number k, $a_p + b_q + k = 0$ is

A) true for $p = k, q = m + n$ for any natural numbers m and n

B) true for $p = m, q = k + n$ for any natural numbers m and n

C) true for $p = n, q = m + k$ for any natural numbers m and n

D) possible for only one specific (p, q)

42. If $a_1, a_2, a_3 ..... a_n$ are in H.P and s_k represents the sum of all 'n' terms except the 'k'th term, then $\frac{a_1}{s_1}, \frac{a_2}{s_2}, \frac{a_3}{s_3}, ..., \frac{a_n}{s_n}$ are in

A) A.P B) G.P C) H.P D) A.G.P

43. The number $\sum_{m=1}^{20}\left(\sum_{k=1}^{m}\left(\sum_{p=k}^{m} {}^{20}C_m \cdot {}^{m}C_p \cdot {}^{p}C_k\right)\right)$ has

A) 3 in units place, 6 in tens place

B) 7 in tens place, 5 in units place

C) 4 in tens place, 7 in units place

D) 9 in units place, 3 in tens place

44. A sequence using distinct positive integers is to be formed so that first n terms of it should include the number 35. The average of these n numbers should be 53. The (n-1) terms other than 35 should have their average equal to 54. The largest possible number that needs to be used is

A) 235 B) 1327 C) 819 D) 979

45. For each integer $n > 1$, let a_n be the number of solutions to the equation $\sin x = \sin(nx)$ on the interval $[0, \pi]$. Then the value of $\sum_{n=2}^{9} a_n =$

A) 50 B) 62 C) 40 D) 56

46. Let $R_n = \left(5\sqrt{5}+11\right)^{2n+1}$ $f_n = R_n - [R_n]$, then value of $\left[\frac{1}{2^{12}}(R_3 f_3)\right] =$ ..... where [.] denotes G.I.F

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

47. Remainder obtained when $55^{95} - 17^{98}$ is divided by 138 is

A) 10 B) 0 C) 76 D) 4

48. If $I(m,n) = \lim_{x\to\infty} \int_{-x}^{x} \frac{dt}{(t^2+m^2)(t^2+n^2)}$ where m and n are natural numbers and $I(3,n), I(6,3), I(n,6)$ form a H.P then n=

A) 2 B) 7 C) 3 D) 4

49. $\{a_n\}$ and $\{b_n\}$ be two sequences given by $a_n = (x)^{\frac{1}{2^n}} + (y)^{\frac{1}{2^n}}$ and $b_n = (x)^{\frac{1}{2^n}} - (y)^{\frac{1}{2^n}}$ for all $n \in N$, then $a_1\ a_2\ a_3 \ldots a_n$ is equal to

A) $x - y$ B) $\frac{x+y}{b_n}$ C) $\frac{x-y}{b_n}$ D) $\frac{xy}{b_n}$

50. The value of $3(288+2\times1320+10\times121)^2-11(720+1320+121)^2$ equals

A) 1 B) 3 C) 2 D) 0

SECTION II

Multiple Correct Answer(s) Type

This section contains **5 multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE are correct.**

51. All the terms of an A.P are natural numbers and sum of first 20 terms is greater than 1072 and less than 1162. If the sixth term is 32, then

A) first term is 12 B) common difference is 4

C) common difference is 5 D) first term is 7

52. If $a_1, a_2, a_3.....a_{16}$ is a sequence of positive numbers which are in AP with common difference 'd' & $a_1+a_4+a_7+......+a_{16}=147$ then.

A) $a_1+a_6+a_{11}+a_{16}=98$ B) $a_1+a_{16}=49$

C) $a_1+a_4+a_7+....a_{16}=6a_1+45d$ D) Maximum value of $a_1a_2.......a_{16}$ is $\left(\frac{49}{2}\right)^{16}$

53. Let g_1, g_2, g_3, g_4 denote four consecutive terms of a G.P. with $g_1 > 0$. The sum of the extreme terms equals -49 and the sum of the middle terms is 14. Let $g_2 g_4$ be x and $g_2 + g_4$ be y, $g_1 g_3$ be p and $g_1 + g_3$ be q. Then

A) There are two values for the common ratio satisfying the hypothesis

B) There is only one G.P. satisfying the hypothesis

C) $\sqrt{\left|\frac{x}{p}\right|} = \frac{1}{2}$

D) $\left|\frac{y}{q}\right| = 2$

54. If n is a positive integer and $\left(3\sqrt{3}+5\right)^{2n+1} = \alpha + \beta$ where α is an integer and $0 < \beta < 1$ then

A) α is an even integer

B) $(\alpha+\beta)^2$ is divisible by 2^{2n+1}

C) The integer just below $\left(3\sqrt{3}+5\right)^{2n+1}$ divisible by 3

D) α is divisible by 10

55. The p^{th} term T_p of HP is $q(p + q)$ and q^{th} term T_q is $p(p + q)$ when $p > 1, q > 1$, $(p \neq q)$ then

A) $T_{p+q} = pq$ B) $T_{pq} = p+q$ C) $T_{p+q} > T_{pq}$ D) $T_{pq} > T_{p+q}$

SECTION III

Integer Answer Type

This section contains **5 questions.** The answer to each question is single digit integer, ranging from 0 to 9 (*both inclusive*).

56. If $(1 + x)^{20} = a_0 + a_1x + a_2x^2 + ... + a_{20}x^{20}$, then the value of

$$\frac{(a_0 - a_4 + a_8 - a_{12} + a_{16} - a_{20})^2 + (a_2 - a_6 + a_{10} + a_{14} - a_{18})^2}{2^2.11^2.13^2.17^2.19^2}$$ is equal to

57. If n is smallest natural number such that the arithmetic, geometric and harmonic means of 25 and n^2 are also natural numbers, then the value of $\left[\frac{n}{7}\right]$, where [.] is greatest integer function, is

58. If the coefficient of x^{16} in $\left(\frac{C_1}{C_0} - x\right)\left(x - 2^2.\frac{C_2}{C_1}\right)\left(x - 3^2.\frac{C_3}{C_2}\right)...\left(x - 17^2.\frac{C_{17}}{C_{16}}\right)$, where C_r stands for ${}^{17}C_r$, is $100K^2 + 27K - 12$ then the integer value of K is

59. If a, b, c, d are positive real numbers such that $a+b+c+d=4$, and p and q are integers such that $(p, q]$ is smallest interval in which $K=(a+b)(c+d)$ can lie, then $q-p=$

60. When the terms in the binomial expansion of $\left(\frac{2}{\sqrt[4]{x}}+\sqrt{x}\right)^n$ are arranged in increasing powers of 'x', the coefficients of the first three terms are in A.P. Then the number of terms in the expansion with non integer powers of 'x' is