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 number of integral values of a such that the equation $\tan^4 x - 2\sec^2 x + \left(a^2 - 6\right) = 0$ possesses at least one solution is

A) 4 B) 5 C) 7 D) 9

42. If $\cos x + \cos y = a,\ \cos 2x + \cos 2y = b,\ \cos 3x + \cos 3y = c$ then the value of $a\left(2a^2 - 3\right) =$

A) ab-c B) 2ab-c C) 3ab-c D) 3ac-b

43. If $\tan^2\left(\pi\left(x+y\right)\right) + \cot^2\left(\pi\left(x+y\right)\right) = 1 + \sqrt{\frac{2x}{1+x^2}}$ where $x, y \in R$ then the least positive value of y equals

A) $\frac{1}{4}$ B) $\frac{3}{4}$ C) $\frac{5}{4}$ D) 2

44. The value of $1 + \operatorname{cosec}\frac{\pi}{4} + \operatorname{cosec}\frac{\pi}{8} + \operatorname{cosec}\frac{\pi}{16} + \operatorname{cosec}\frac{\pi}{32}$ equals

A) $\cot\frac{\pi}{64}$ B) $\cot\frac{\pi}{32}$ C) $\frac{1}{2}\cot\frac{\pi}{32}$ D) $\frac{1}{4}\cot\frac{\pi}{8}$

45. If $l=\sin\frac{2\pi}{7}+\sin\frac{4\pi}{7}+\sin\frac{8\pi}{7}$ and $m=\cos\frac{2\pi}{7}+\cos\frac{4\pi}{7}+\cos\frac{8\pi}{7}$ then the value of $\frac{l^2+m^2}{l^2-m^2}$ equals

A) $\frac{4}{3}$ B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) 6

46. For the smallest positive values of x and y for which the equation $2(\sin x+\sin y)-2\cos(x-y)=3$ has a solution then the value of $\sin^2\left(\frac{x+y}{2}\right)+\cos^2\left(\frac{x-y}{2}\right)$ equals

A) $\frac{3}{4}$ B) $\frac{5}{4}$ C) $\frac{3}{2}$ D) 2

47. If $a_0=\sqrt{2}+\sqrt{3}+\sqrt{6}$ and $b_0=\cot\frac{\pi}{24}$ then which is true

A) $b_0=a_0+2$ B) $b_0=a_0-2$ C) $b_0=a_0+4$ D) $b_0=a_0-4$

48. If the equation $x^2+4\cos(\alpha x+\beta)+5=2x$ has at least one solution where $\alpha,\beta\in[2,5]$ then the value of $\frac{\sin\frac{\alpha}{2}+\sin\frac{\beta}{2}}{\cos\frac{\alpha}{2}+\cos\frac{\beta}{2}}$ equals

A) $\sin(\alpha+\beta)$ B) $\cos(\alpha+\beta)$ C) $\sin(\alpha-\beta)$ D) $\cos(\alpha-\beta)$

49. The number of solutions for the equation $\left(\sqrt{3}\sin x+\cos x\right)^{\sqrt{3}\sin 2x-\cos 2x+2}=4$ when $x\in(-\pi,\pi)$ equals

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

50. The equation $|2a\sin\theta-3|+|a\sin\theta+1|+|5-a\sin\theta|=\frac{1}{2}$ possesses

A) infinite number of solutions for some $a\in R$

B) finite number of solutions for some $a\in R$

C) no real solution for only $a=0$

D) no real solution for any $a\in R$

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. Let $x,y\in\left(0,\frac{\pi}{2}\right)$ and $2\sin x=\sin y$ and $2\cos x=3\cos y$ then which is/are correct

A) $\tan^2 x=\frac{5}{27}$ B) $\cos 2y=\frac{4}{9}\left(10\cos^2 x-1\right)$

C) $\tan^2 y=\frac{1}{2}$ D) $\left[\tan\left(x+y\right)\right]=3\left([\ ]\,is\,GIF\right)$

52. If $x\cos B = y\cos A$ and $A \neq B$ then which is/are always correct

A) $(x+y)\tan\left(\frac{A+B}{2}\right) = x\tan A + y\tan B$

B) $(x+y)\tan\left(\frac{A-B}{2}\right) = x\tan A - y\tan B$

C) $\sin(A+B)(y\sin A - x\sin B) = (y\sin A + x\sin B)\sin(A-B)$

D) $x\tan A + y\tan B = 0$

53. Which is / are false?

A) $\frac{\sin 1}{\sin 2} - \frac{\sin 5}{\sin 6}$ is negative

B) $\tan\left(\frac{3}{2}\right) - \frac{9}{4}$ is positive

C) $\left(\frac{\sin 1}{\sin 2} - \frac{\sin 5}{\sin 6}\right)\left(\tan\left(\frac{3}{2}\right) - \frac{9}{4}\right)$ is positive

D) $\left(\frac{\sin 1}{\sin 2} - \frac{\sin 5}{\sin 6}\right)\left(\tan\left(\frac{3}{2}\right) - \frac{9}{4}\right)$ is negative

54. Consider three properties

(i) function is periodic

(ii) function is either even (or) odd

(iii) function is bounded in its domain then identity the function or functions having at least two properties

A) $f(x)=\cos x+\left[\left|\frac{\sin x}{4}\right|\right],([\ ]\text{is G.I.F})$

B) $g(x)=\frac{\sin+\sin 7x}{\cos x+\cos 7x}$

C) $h(x)=\{x\}+|\cos x|\ (\{\ \}\text{is fractional part function})$

D) $\theta(x)=|\cos x|+\ln(\sin x)$

55. Let $x,y,z\in\left(0,\frac{\pi}{2}\right)$ are first three consecutive terms of an arithmetic progression such that $\cos x+\cos y+\cos z=1$ and $\sin x+\sin y+\sin z=\frac{1}{\sqrt{2}}$

Then which is/are correct.

A) $[\cot y]=1$

B) $\cos(x-y)=\frac{\sqrt{3}-\sqrt{2}}{2\sqrt{2}}$

C) $\tan 2y=\frac{2\sqrt{2}}{3}$

D) $\sin(x-y)+\sin(y-z)=0$

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 $\cos\left(\frac{\pi}{4}-x\right)\cos 2x+\sin x\sin 2x\sec x=\cos x\sin 2x\sec x+\cos\left(\frac{\pi}{4}+x\right).\cos 2x$ then sum of possible integral values of $\sec^2 x$ is

57. If $2\sin^2(\frac{\pi}{2}\cos^2 x)=1-\cos\left(\pi\sin^2 2x\right), x\neq(2n+1)\frac{\pi}{2}, n\in I$ then the value of $\left|\left[8\cos 4x\right]\right| equals\ \left(where[\ ]isGIF\right)$

58. If $\tan\left(\frac{\pi}{4}+\frac{y}{2}\right)=\tan^3\left(\frac{\pi}{4}+\frac{x}{2}\right)$ than the value of $\lim\limits_{x\to 0}\frac{\sin y}{x}$ equals

59. The value of $\left|8\sum_{r=0}^{10}\cos^3\left(\frac{\pi r}{3}\right)\right|$

60. Let the smallest positive value of x for which the expression $f(x)=\sin\frac{x}{3}+\sin\frac{x}{11}$ $(x\in R)$ achieves maximum value be α. If α expressed in degrees i.e. $\alpha=y^0$ then the first digit in y equals.