IIT-JEE-2012-P2-Model

Time:2:00 PM to 5:00 PM **IMPORTANT INSTRUCTIONS** **Max Marks: 198**

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 8)	Questions with Single Correct Choice	3	-1	8	24
Sec – II(Q.N : 9 – 14)	Questions with Comprehension Type (3 Comprehensions : 2+2+2 = 6Q)	3	-1	6	18
Sec – III(Q.N : 15 – 20)	Questions with Multiple Correct Choice	4	0	6	24
Total				**20**	**66**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 21 – 28)	Questions with Single Correct Choice	3	-1	8	24
Sec – II(Q.N : 29 – 34)	Questions with Comprehension Type (2 Comprehensions : 3+3 = 6Q)	3	-1	6	18
Sec – III(Q.N : 35 – 40)	Questions with Multiple Correct Choice	4	0	6	24
Total				**20**	**66**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : (41 – 48)	Questions with Single Correct Choice	3	-1	8	24
Sec – II(Q.N : (49 – 54)	Questions with Comprehension Type (3 Comprehensions : 2+2+2 = 6Q)	3	-1	6	18
Sec – III(Q.N : 55 – 60)	Questions with Multiple Correct Choice	4	0	6	24
Total				**20**	**66**

MATHS: **Max. Marks: 66**

SECTION – I
(SINGLE CORRECT CHOICE TYPE)

This section contains **8 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE is correct**

41. In a ΔABC for given values of a, b and A if the remaining angles of the two triangles are $B_1, C_1 and\ B_2, C_2$, then the value of $\frac{\sin C_1}{\sin B_1}+\frac{\sin C_2}{\sin B_2}$, is

A) 2 cosA B) cosA C) sinA D) 2 sin A

42. Incircle of ΔABC meets the side BC at D and excircle of ΔABC opposite to vertex A meets BC at D^1 then $|MD-MD^1|=$ _____ where M is the mid point of BC

A) $|a-c|$ B) b+c-a C) 0 D) $\frac{a+c}{2}$

43. The product of all real values of x satisfying the equation

$$\sin^{-1}\left(\cos\left(\frac{2x^2+10|x|+4}{x^2+5|x|+3}\right)\right)=\cot\left(\cot^{-1}\left(\frac{2-18|x|}{9|x|}\right)\right)+\frac{\pi}{2}$$ is

A) 9 B) -9 C) -3 D) – 1

44. If in a right angled triangle ABC, $4\sin A\cos B-1=0$ and $\tan A$ is real then

A) angles are in AP

B) angles are in GP

C) In-radius of triangle ABC is 1

D) circum radius of triangle ABC is 1

45. Let P be an interior point of triangle ABC and AP, BP, CP meets the sides BC, CA, AB at D,E,F respectively then the value of $\frac{AF}{FB}+\frac{AE}{EC}-\frac{AP}{PD}$ is

A) 1 B) ½ C) 0 D) 1/3

46. The value of $\left[\cos 1-\cos^{-1}1\right]-\left[\sin 1-\sin^{-1}1\right]+\left[\tan 1-\tan^{-1}1\right]-\left[\cot 1-\cot^{-1}1\right]$ $+\left[\sec 1-\sec^{-1}1\right]-\left[\cos ec1-\cos ec^{-1}1\right]$ is equal to (where [x] denotes greatest integer function)

A)3 B)4 C)5 D)6

47. Number of integral ordered pairs (x,y) satisfying the equation

$\tan^{-1}\left(\frac{1}{x}\right)+\tan^{-1}\left(\frac{1}{y}\right)=\tan^{-1}\left(\frac{1}{10}\right)$ is

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

48. In a triangle the sum of two sides is x and the product of the same two sides is y. If $x^2-c^2=y$, where c is the third side of the triangle, then the ratio of the in-radius to the circum-radius of the triangle is

A) $\frac{3y}{2x(x+c)}$ B) $\frac{3y}{2c(x+c)}$ C) $\frac{3y}{4x(x+c)}$ D) $\frac{3y}{4c(x+c)}$

SECTION - II
(COMPREHENSION TYPE)

This section contains **6 multiple choice questions** relating to three paragraphs with two questions on each paragraph. Each question has 4 choices A), B), C) and D) for its answer, out of which **ONLY ONE is correct.**

Paragraph for Questions 49 and 50

If x,y are real numbers such that xy< 1 then $Tan^{-1}x+Tan^{-1}y=Tan^{-1}\left(\frac{x+y}{1-xy}\right)$

49. If a,x,y are all +ve real numbers and xy = a^2+1 then $Tan^{-1}\left(\frac{1}{a+x}\right)+Tan^{-1}\left(\frac{1}{a+y}\right)=$ _____

A) $Tan^{-1}\left(\frac{1}{a+x+y}\right)$ B) $Tan^{-1}\left(\frac{1}{a-(x+y)}\right)$

C) $Tan^{-1}\left(\frac{1}{a-(x-y)}\right)$ D)independent of x and y

50. $5\ Tan^{-1}\frac{1}{8}+2Tan^{-1}\frac{1}{18}+3Tan^{-1}\frac{1}{57}=$ _____

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

Paragraph for Questions 51and 52

AP is a diameter of a unit circle with centre at O. Let AC be an arc of this circle, which subtends angle θ radian at centre O. A tangent line is drawn to the circle at the point A and a segment AB on this tangent is laid off whose length is equal to that of the arc AC (B,C lie on the same side of line AO). A straight line BC is drawn to intersect the diameter line AP at Q. CD is the perpendicular from the point C upon the diameter AP.

51. The area of the trapezoid $ABCD$ is

A) $\frac{1-\cos\theta}{\theta-\sin\theta}$ B) $(\theta+\sin\theta)\sin^2\frac{\theta}{2}$

C) $2\cos^2\frac{\theta}{2}(\theta-\sin\theta)$ D) $\theta(\theta+\sin\theta)$

52. The value of the limit $\lim_{\theta\to 0^+}(AQ)$ is

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

Paragraph for Questions 53 and 54

Let ABC be a triangle such that

$$\left(\cot\frac{A}{2}\right)^2+\left(2\cot\frac{B}{2}\right)^2+\left(3\cot\frac{C}{2}\right)^2=\left(\frac{6s}{7r}\right)^2$$

where s and r denotes its semi-perimeter and its inradius respectively.

53. In triangle ABC a : b : c is

A) 7 : 13 : 19 B) 13 : 40 : 45 C) 7 : 20 : 23 D) 26 : 81 : 90.

54. $\dfrac{\cot\frac{A}{2}}{\cot\frac{B}{2}}+\dfrac{\cot\frac{B}{2}}{\cot\frac{C}{2}}+\dfrac{\cot\frac{C}{2}}{\cot\frac{A}{2}}$ is equal to

A) $\frac{226}{36}$ B) $\frac{225}{36}$ C) $\frac{221}{36}$ D) $\frac{229}{36}$

SECTION – III
(MULTIPLE CORRECT CHOICE TYPE)

This section contains **6 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**

55. If $\alpha=3\sin^{-1}\left(\frac{6}{11}\right)$ and $\beta=3\cos^{-1}\left(\frac{4}{9}\right)$, where the inverse trigonometric functions take only the principal values, then the correct option(s) is (are)

A) $\cos\beta>0$ B) $\sin\beta<0$ C) $\cos(\alpha+\beta)>0$ D) $\cos\alpha<0$

56. Let $\cos^{-1}\left(\frac{x^2-1}{x^2+1}\right)+\sin^{-1}\left(\frac{2x}{x^2+1}\right)+\tan^{-1}\left(\frac{2x}{x^2-1}\right)=2\pi/3$

A) The number of values of x satisfying the above equation is 2

B) solution of x are irrational

C) The sum of the values of x is less than 3

D) The sum of the values of x is greater than 5

57. Let P be an interior point of triangle ABC. Let $P_1 \geq 1, P_2 \geq 2, P_3 \geq 3$ be the lengths of altitudes drawn from P to the sides BC,CA,AB respectively . Let h_1, h_2, h_3 be the lengths of altitudes drawn from A,B,C to the opposite sides. If circles are drawn with all such possible positions of P as centres and $\frac{P_1}{h_1}+\frac{P_2}{h_2}+\frac{P_3}{h_3}$ as radius , then

A) some circles meet one side of ΔABC

B) some circles meet two sides of ΔABC

C) some circles meet all sides of ΔABC

D) some circles meet no side of ΔABC

58. In the triangle ABC the medians drawn from vertices B and C are perpendicular. Then the value of $\cot B + \cot C$ can be

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

59. A triangle has altitudes of length 4 and 12. If the length of the third altitude is 'p' which is also an integer, then 'p' can be

A) 3 B) 4 C) 5 D) 6

60. If the ortho–centre of an isosceles triangle lies on the in–circle of the triangle then

A) The base angle of the triangle is $\cos^{-1}\frac{2}{3}$

B) The triangle is acute

C) The base angle of the triangle is $\tan^{-1}\frac{\sqrt{5}}{2}$

D) If S, I are the circumcentre and in–centre and R is circum–radius of the triangle then $\frac{SI}{R} = \frac{1}{3}$