

# Sri Chaitanya IIT Academy.,India.

✧ A.P ✧ T.S ✧ KARNATAKA ✧ TAMILNADU ✧ MAHARASTRA ✧ DELHI ✧ RANCHI

*A right Choice for the Real Aspirant*

ICON Central Office - Madhapur - Hyderabad

Sec: **Sr.Super60\_NUCLEUS & STERLING\_BT**

**Paper -1(Adv-2020-P1-Model)**

**Date: 27-08-2023**

**Time: 09.00Am to 12.00Pm**

**RPTA-04**

**Max. Marks: 198**

**27-08-2023\_Sr.Super60\_NUCLEUS&STERLING\_BT\_Jee-Adv(2020-P1)\_RPTA-04\_Syllabus**

## PHYSICS

: General Physics: General Units and dimensions, dimensional analysis; least count, significant figures; Methods of measurement and error analysis for physical quantities pertaining to the following experiments: Experiments based on using Vernier calipers and screw gauge (micrometer), Determination of  $g$  using simple pendulum, Simple Pendulum-dissipation of energy by plotting a graph between the square of amplitude and time, Metre Scale - the mass of a given object by the principle of moments, Kinematics : Kinematics in one and two dimensions, Projectile motion, Relative velocity.

## CHEMISTRY

: Benzene, Alkyl Halides & Aryl Halides: Benzene :Reactions of benzene, Structure and aromaticity ; Electrophilic Substitution Reactions; halogenation, nitration, sulphonation, friedel-crafts alkylation and acylation; Effect of directing groups (mono substituted benzenes) in these reactions. Alkyl halides & aryl halides: rearrangement reactions of alkyl carbocation, Grignard reactions, nucleophilic substitution reactions; Haloarenes :Fittig, Wurtz-Fittig, nucleophilic aromatic substitution in haloarenes and substituted haloarenes (excluding Benzyne mechanism and Cine substitution).

## MATHEMATICS

: Indefinite Integration

Name of the Student: \_\_\_\_\_

H.T. NO:

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**JEE-ADVANCE-2020-P1-Model**

Time: 3:00Hour's

**IMPORTANT INSTRUCTIONS**

Max Marks: 198

**PHYSICS:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total mark
Sec – I(Q.N : 1 – 6)	Questions with Single Correct Choice	3	-1	6	18
Sec – II(Q.N : 7 – 12)	<b>Questions with Multiple Correct Choice +1 partial marks</b>	4	-2	6	24
Sec – III(Q.N : 13 – 18)	Questions with Numerical Value Answer Type	4	0	6	24
<b>Total</b>				<b>18</b>	<b>66</b>

**CHEMISTRY:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 19 – 24)	Questions with Single Correct Choice	3	-1	6	18
Sec – II(Q.N : 25 – 30)	<b>Questions with Multiple Correct Choice +1 partial marks</b>	4	-2	6	24
Sec – III(Q.N : 31 – 36)	Questions with Numerical Value Answer Type	4	0	6	24
<b>Total</b>				<b>18</b>	<b>66</b>

**MATHEMATICS:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 37 – 42)	Questions with Single Correct Choice	3	-1	6	18
Sec – II(Q.N : 43 – 48)	<b>Questions with Multiple Correct Choice +1 partial marks</b>	4	-2	6	24
Sec – III(Q.N : 49 – 54)	Questions with Numerical Value Answer Type	4	0	6	24
<b>Total</b>				<b>18</b>	<b>66</b>

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Space for rough work

Page 2

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Educational Institutions**THE PERFECT HAT-TRICK WITH ALL- INDIA RANK 1  
IN JEE MAIN 2023 JEE ADVANCED 2023 AND NEET 2023****JEE MAIN  
2023**SINGARAJU  
VENKAT KOUNDINYA  
RANK 1  
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MARKS**RANK  
1****JEE Advanced  
2023**VAVILALA  
CHIOVILAS REDDY  
RANK 1  
341  
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MARKS**RANK  
1****NEET  
2023**BORA VARUN  
CHAKRAVARTHI  
RANK 1  
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## PHYSICS

Max Marks: 66

**SECTION – I**  
**(SINGLE CORRECT ANSWER TYPE)**

This section contains **SIX** (06) questions.

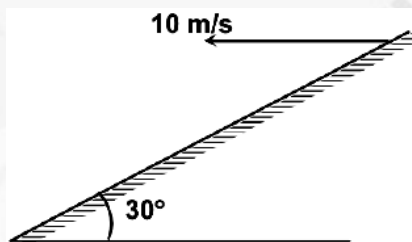
- Each question has **FOUR** options. **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated **according to the following marking scheme:**

**Full Marks :** +3 If **ONLY** the correct option is chosen;

**Zero Marks :** 0 If none of the options is chosen (i.e. the question is unanswered);

**Negative Marks :** -1 In all other cases

1. A particle is projected horizontally from an inclined plane with speed 10 m/s as shown in figure. ( $g = 10 \text{ ms}^{-2}$ ) choose the correct option



- A) Range along inclination is 10 m
- B) Time of flight is  $\frac{2}{\sqrt{3}}$  sec
- C) Speed of particle when it strikes inclined plane is 15 m/s
- D) Time of flight is  $\sqrt{3}$  sec
2. A parachutist descends uniformly at a speed of 8 m/s in calm weather. What will the terminal speed of the parachutist be if there is a 6 m/s crosswind in the horizontal direction ?
- A) 8 m/s      B) 10 m/s      C) 2 m/s      D)  $2\sqrt{7}$  m/s
3. Four students Ram, Shyam, Ghanshyam and Radheshyam perform an optical bench experiment to find focal length of a convex lens. Ram forms image of a distant luminous object on a small screen mounted on the optical bench. Other 3 students perform usual optical bench experiment. Their position of object needle, lens and image needle are given below. Which of the student is most accurate in his result?

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Space for rough work

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**IN JEE MAIN 2023 JEE ADVANCED 2023 AND NEET 2023**

**JEE MAIN**  
**2023**

SINGARAJU  
VENKAT KOUNDINYA  
SRI CHAITANYA  
8<sup>th</sup>-12<sup>th</sup> Class  
**300**  
**300**  
MARKS



RANK

**JEE Advanced**  
**2023**

VAVILALA  
CHIOVILAS REDDY  
SRI CHAITANYA  
8<sup>th</sup>-12<sup>th</sup> Class  
**341**  
**360**  
MARKS



RANK

**NEET**  
**2023**

BORA VARUN  
CHAKRAVARTHI  
SRI CHAITANYA  
8<sup>th</sup>-12<sup>th</sup> Class  
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MARKS



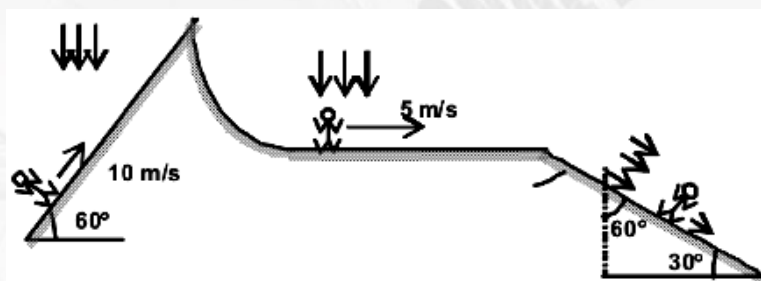
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Name	Object	Lens	Image
Ram	-----	15.0 cm	30.0 cm
Shyam	15.0 cm	75.0 cm	95.0 cm
Ghanshyam	15.0 cm	45.0 cm	75.0 cm
Radheshyam	15.0 cm	60.0 cm	82.5 cm

- A) Ram** **B) Ghanshyam**  
**C) Radheshyam** **D) All are equally accurate**

4. In the figure, the man is moving on the track and rain appeared to him as shown by arrows. Find the actual speed of the rain in meter per second.



- A)  $10\sqrt{3}$       B)  $\frac{10}{\sqrt{3}}$       C)  $5\sqrt{3}$       D)  $\frac{5}{\sqrt{3}}$

5. A student uses a simple pendulum of exactly 1 m length to determine  $g$ , the acceleration due to gravity. He uses a stopwatch with the least count of 1 sec for this and records 40 seconds for 20 oscillations. For this observation, which of the following statement is **TRUE**?
- A) Error  $\Delta T$  in measuring  $T$ , the time period is 0.05 seconds.  
B) Error  $\Delta T$  in measuring  $T$ , the time period is 5%.  
C) Error  $\Delta T$  in measuring  $T$ , the time period is 0.1 seconds.  
D) Error  $\Delta T$  in measuring  $T$ , the time period is 1%.



6. Which of the following is a **CORRECT** statement?

A)  $2.3056 + 10.138 - 7.4671 = 4.9765$

B)  $2.38 \times 1.0 = 2.38$

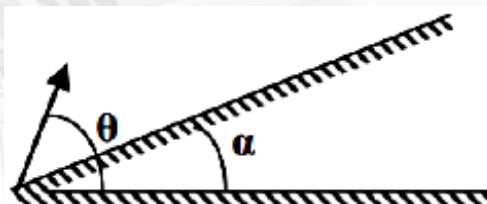
C)  $\frac{8.05}{3.1} = 2.6$

D)  $(1.11 - 0.1) \times 9.0 = 9.0$

**SECTION – II**  
**(ONE OR MORE CORRECT ANSWER TYPE)**

- This section contains **SIX** (06) questions.
- Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated **according to the following marking scheme**:  
**Full Marks** : +4 If only (all) the correct option(s) is(are) chosen;  
**Partial Marks** : +3 If all the four options are correct but ONLY three options are chosen;  
**Partial Marks** : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;  
**Partial Marks** : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;  
**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered);  
**Negative Marks** : -2 In all other cases

7. A perfectly elastic particle is projected with velocity  $v$  at an elevation  $\theta$ . A smooth plane passes through the point of projection and is inclined at an angle  $\alpha$  to the horizontal. The particle will return to the point of projection provided  $\cot \alpha \cot(\theta - \alpha)$  is



- A) 2                      B) 2.5                      C) 3                      D) 4

8. The pitch of a screw gauge is 0.5 mm and there are 100 divisions on its circular scale. The instrument reads 2 circular divisions when nothing is put in between its jaws. In measuring the diameter of a wire, there are 8 divisions on the main scale and 83<sup>rd</sup> division coincides with the reference line. Then choose the correct option(s).

- A) Screw gauge is having zero error of  $-0.01$  mm.  
 B) Screw gauge is having zero error of  $-0.49$  mm.  
 C) Diameter of the wire is 4.405 mm.  
 D) Diameter of the wire is 4.425 mm.

**JEE MAIN**  
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**JEE Advanced**  
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CHIOVILAS REDDY  
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MARKS

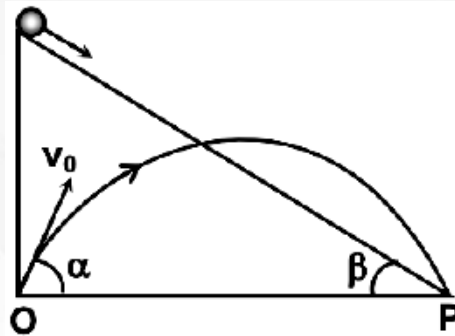
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**NEET**  
**2023**BORA VARUN  
CHAKRAVARTHI  
RANK 1  
720  
720  
MARKS

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9. Two point objects one sliding down from rest on a frictionless inclined plane of inclination  $\beta$  with the horizontal the other being projected in air from the point O at an angle  $\alpha$  with horizontal start their motion at the same instant. Initially both point objects are along the same vertical line. Both get to the point P at the same time and the same speed. Then choose the correct option(s).



- A)  $2\sin\alpha = \frac{1}{\sin\beta}$  B)  $2\cos\alpha = \cos\beta$  C)  $\sin\alpha = \frac{2}{\sin\beta}$  D)  $\cos\alpha = 2\cos\beta$
10. Two resistors  $R_1$  and  $R_2$  have measured values as  
 $R_1 = 3.0\Omega \pm 0.1\Omega$ ;  $R_2 = 6.0\Omega \pm 0.2\Omega$   
 Then  
 A) Least count of device used to measure  $R_2$  must be  $0.2\Omega$   
 B) When connected in series the error will be 3.34%  
 C) When connected in parallel the error will be  $0.1\Omega$  (approx.)  
 D) When connected in parallel the error will be  $0.2\Omega$  (approx.)
11. If the dimensions of length are expressed as  $G^x c^y h^z$ ; which G, c and h are the universal gravitational constant, speed of light and Plank's constant respectively then  
 A)  $x = \frac{1}{2}, y = \frac{1}{2}$  B)  $x = \frac{1}{2}, z = \frac{1}{2}$  C)  $y = \frac{1}{2}, z = \frac{3}{2}$  D)  $y = -\frac{3}{2}, z = \frac{1}{2}$







12. Focal length of a lens is determined by the  $u-v$  method using the optical bench. A particular reading was ( $u = -50$  cm;  $v = +25$  cm). The least count of the optical bench is 1 mm. Find the maximum permissible percentage error for this measurement.
- A)  $\frac{5}{3}$       B)  $\frac{10}{3}$       C)  $\frac{1.8}{150}$       D)  $\frac{1}{3}$

**SECTION – III**  
**(NUMERICAL VALUE TYPE)**

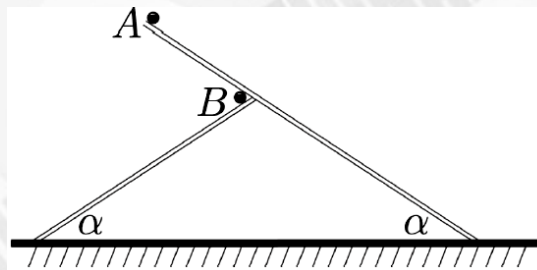
- This section contains **SIX** (06) questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.
- Answer to each question will be evaluated **according to the following marking scheme:**  
**Full Marks : +4** If ONLY the correct numerical value is entered;  
**Zero Marks : 0** In all other cases

13. In a car race, car A takes 4s less than car B at the finish and passes the finishing point with a velocity  $v$  more than the car B. Assuming that the cars start from rest and travel with constant acceleration  $a_1 = 4\text{ms}^{-2}$  and  $a_2 = 1\text{ms}^{-2}$  respectively, find the velocity of  $v$  in  $\text{ms}^{-1}$ .
14. At normal incidence, a beam of light propagating in vacuum reflects off an interface with a medium of refractive index  $n = 2.0$ . The fraction of energy reflected,  $R$  is given by  $R = \left(\frac{n-1}{n+1}\right)^2$ . If the fractional error in the value of  $n$  is 3%, the fractional error in the estimation of  $R$  is
15. A block is pushed onto a conveyor belt. The belt is moving at velocity  $v_0 = 1\text{ m/s}$ , the block's initial velocity  $u_0 = 2\text{ m/s}$  is perpendicular to the belt's velocity. During its subsequent motion, what is the minimum velocity of the block with respect to the ground? The coefficient of friction is large enough to prevent the block from falling off the belt. If minimum velocity is  $\frac{2}{\sqrt{n}}$ . Find  $n = ?$



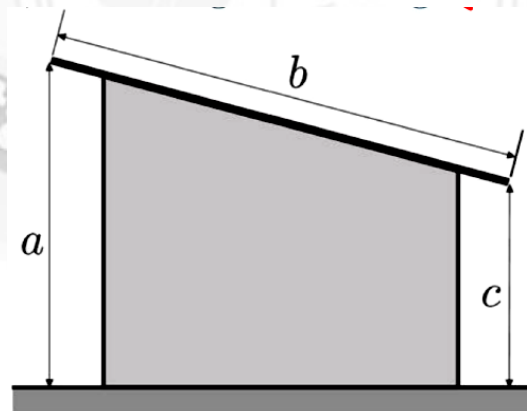


16. After being kicked by a footballer, a ball started to fly straight towards the goal at velocity  $v = 25 \text{ m/s}$  making an angle  $\alpha = 37^\circ$  with the horizontal. Due to side wind blowing at  $u = 10 \text{ m/s}$  perpendicular the initial velocity of the ball, the ball had deviated from its initial course by  $s = 2 \text{ m}$  by the time it reached the plane of the goal. Find the time that it took the ball to reach the plane of the goal, if the goal was situated at distance  $L = 32 \text{ m}$  from the footballer. (Drag force of air is side ways ( $g = 10 \text{ m/sec}^2$ ))
17. Two smooth slides lie within the same vertical plane and make angles  $\alpha$  to the horizontal (see the figure). At some moment, two small balls are released from points A and B and they start sliding down. It took time  $t_1$  for the first ball that started from point A to reach the ground; for the second one the time of descent was  $t_2$ . At what time  $t$  was distance between the balls the smallest?



If  $t_1 = 5 \text{ sec}$  and  $t_2 = 3 \text{ sec}$ . Find  $t = ?$

18. With what minimum velocity  $V$ , a stone should be thrown from the ground, such that it touches the both ends of inclined plane. Given  $b = 20 \text{ m}$ ,  $a = 12 \text{ m}$  and  $C = 8 \text{ m}$ . ( $g = 10 \text{ m/sec}^2$ )



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VENKAT KOUNDINYA  
AIR NO. 1  
Sri Chaitanya  
B-12<sup>th</sup> Class  
**300**  
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MARKS



**RANK**  
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**JEE Advanced**  
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MARKS



**RANK**  
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**NEET**  
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B-12<sup>th</sup> Class  
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MARKS



**RANK**  
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## CHEMISTRY

Max Marks: 66

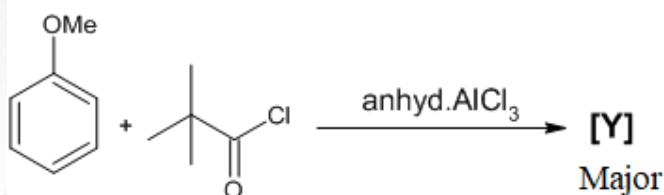
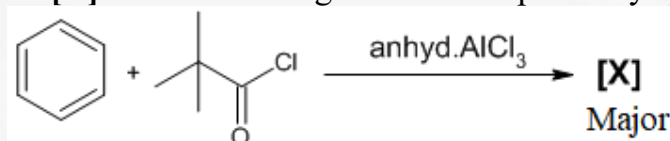
SECTION – I  
(SINGLE CORRECT ANSWER TYPE)

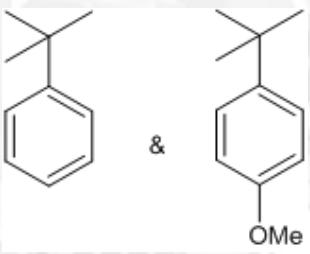
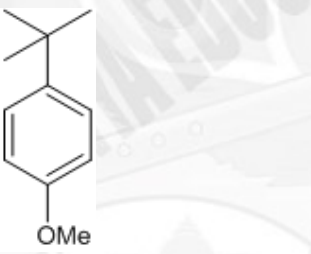
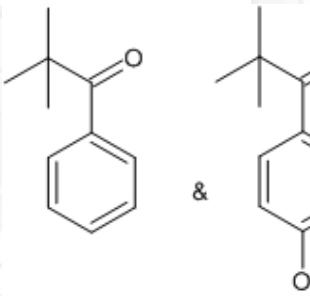
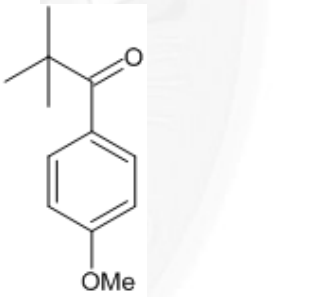
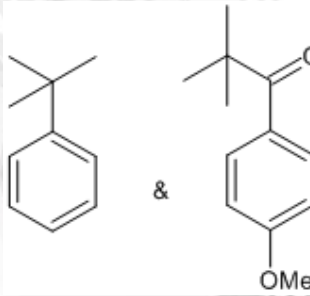
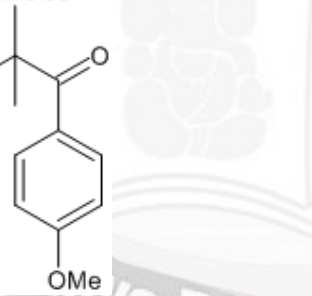
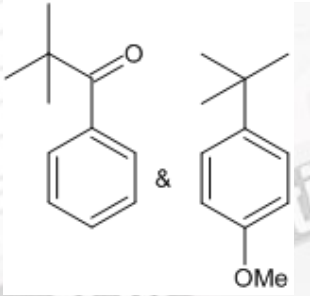
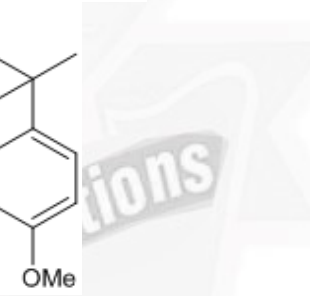
This section contains SIX (06) questions.

- Each question has **FOUR** options. **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated **according to the following marking scheme**:

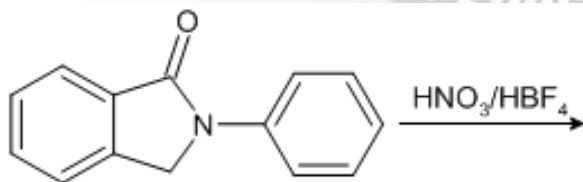
**Full Marks** : +3 If **ONLY** the correct option is chosen;**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered);**Negative Marks** : -1 In all other cases

19. Compounds [X] and [Y] in the following reactions respectively are



- A)  & 
- B)  & 
- C)  & 
- D)  & 

20. The major product of the following reaction is



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RANK 1  
300  
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MARKS

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**JEE Advanced  
2023**VAVILALA  
CHIOVILAS REDDY  
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MARKS

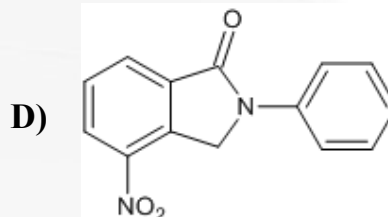
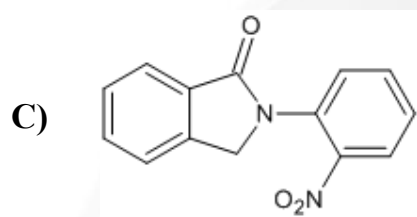
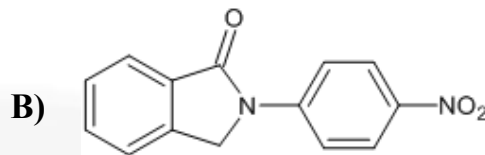
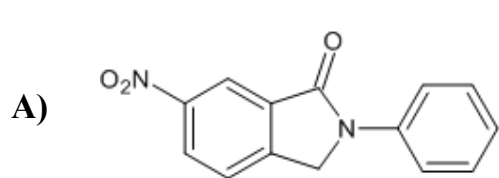
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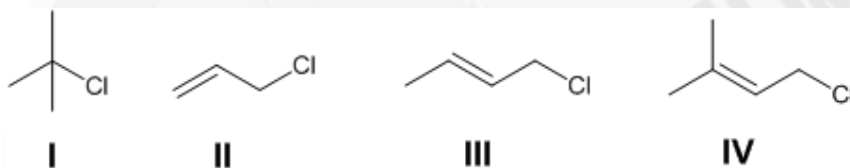
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2023**BORA VARUN  
CHAKRAVARTHI  
RANK 1  
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MARKS

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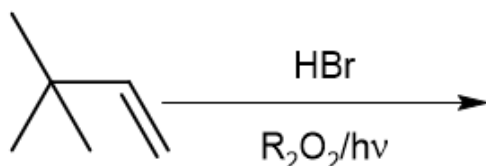


21. The correct order of reactivity of the following compounds towards  $S_N1$  reaction is

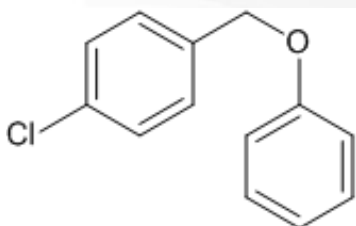


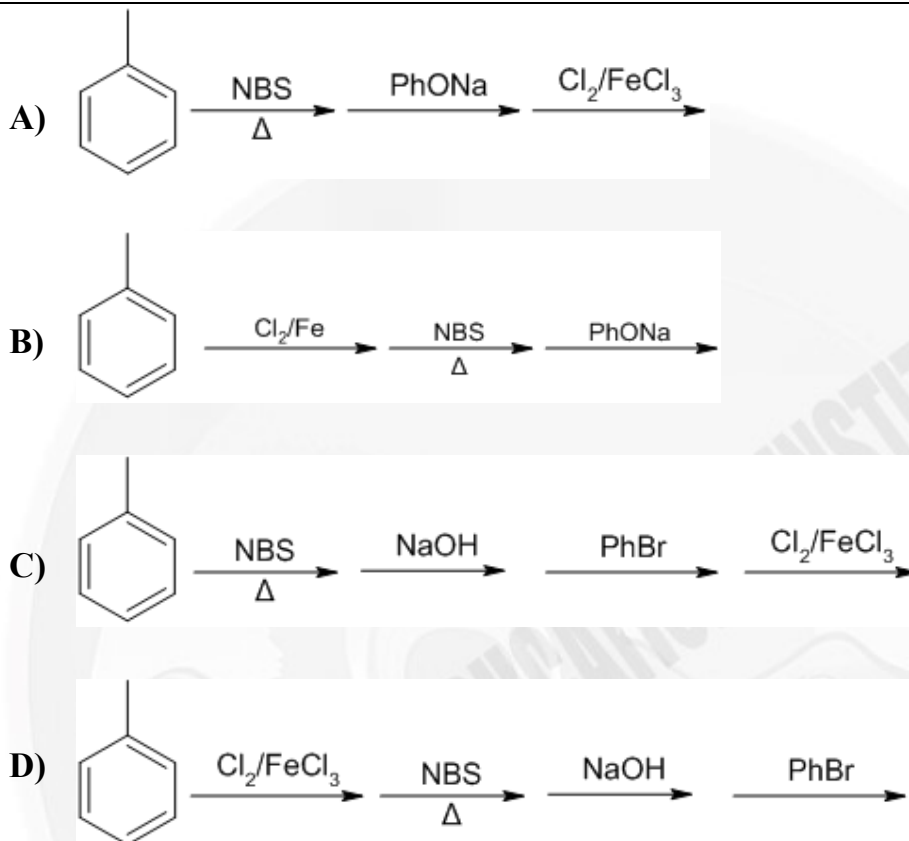
A) I>II>III>IV    B) I>IV>III>II    C) IV>I>III>II    D) IV>III>II>I

22. The major product of the following reaction is

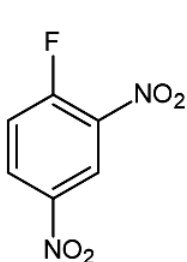


23. Starting with toluene, which of the following is the best method to make the ether shown below? (Assume that you can separate ortho and para isomers)

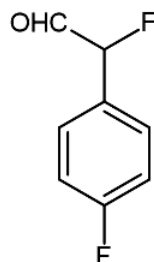




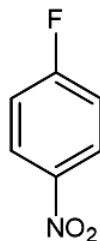
24. Which of the following compounds liberate(s) fluoride ion on warming with aqueous NaOH?



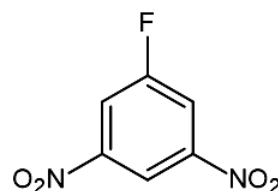
I



II



III



IV

A) II only

B) I&amp;III only

C) I, II&amp;III only

D) IV only

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2023**BORA VARUN  
CHAKRAVARTHI  
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MARKS**RANK  
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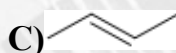
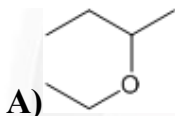
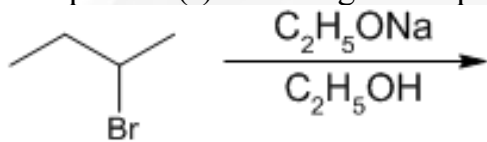


## SECTION – II

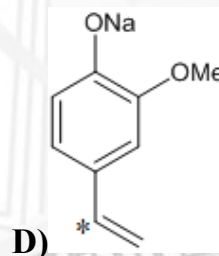
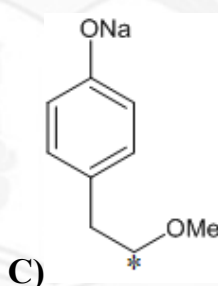
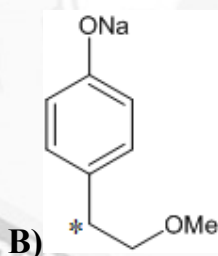
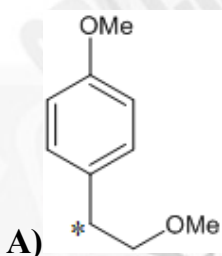
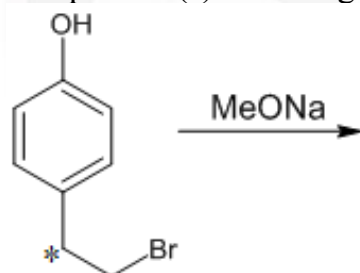
### (ONE OR MORE CORRECT ANSWER TYPE)

- This section contains **SIX** (06) questions.
  - Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
  - For each question, choose the option(s) corresponding to (all) the correct answer(s).
  - Answer to each question will be evaluated **according to the following marking scheme**:
- Full Marks** :+4 If only (all) the correct option(s) is(are) chosen;  
**Partial Marks** :+3 If all the four options are correct but ONLY three options are chosen;  
**Partial Marks** :+2 If three or more options are correct but ONLY two options are chosen, both of which are correct;  
**Partial Marks** :+1 If two or more options are correct but ONLY one option is chosen and it is a correct option;  
**Zero Marks** :0 If none of the options is chosen (i.e. the question is unanswered);  
**Negative Marks** :-2 In all other cases

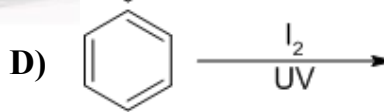
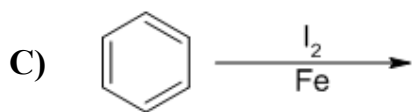
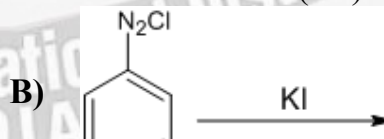
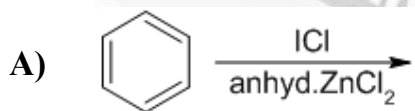
25. The product(s) including minor product(s) formed in the following reaction is(are)



26. The product(s) including minor products of the reaction given below is(are)

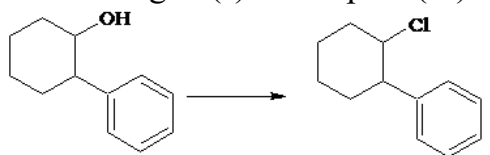


27. The reaction(s) which can be used to synthesize iodobenzene is(are)





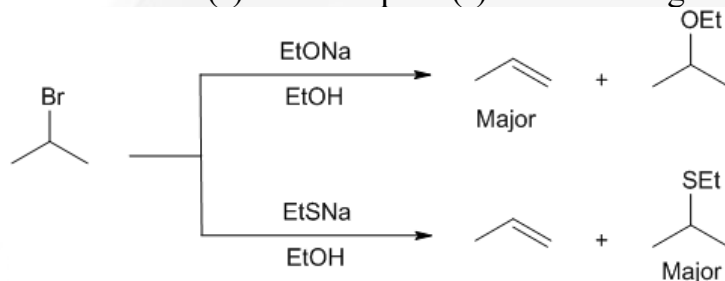
28. Which reagent(s) accomplish(es) the following change?



Major

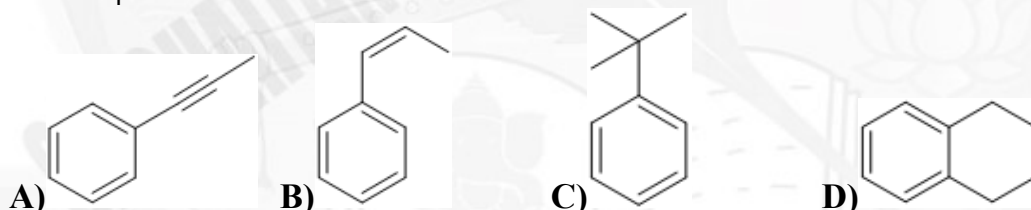
- A) NaCl      B)  $\text{SOCl}_2$       C)  $\text{HCl} - \text{ZnCl}_2$       D)  $\text{PCl}_5$

29. The statement(s) which explain(s) the following observation is



- A) EtONa is a stronger base than EtSNa  
 B) EtSNa is a stronger nucleophile than EtONa.  
 C) EtONa is a stronger nucleophile as well as stronger base than EtSNa.  
 D) EtONa is a stronger nucleophile than EtSNa but a weaker base.

30. Which of the following compounds give(s) benzoic acid on treatment with acidified  $\text{KMnO}_4$ ?

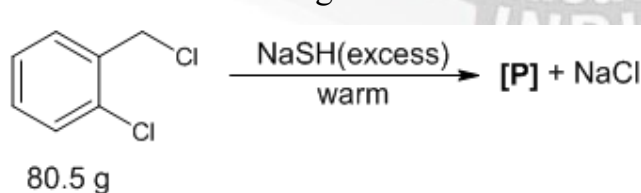


### SECTION – III

#### (NUMERICAL VALUE TYPE)

- This section contains **SIX** (06) questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.
- Answer to each question will be evaluated **according to the following marking scheme**:  
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**Zero Marks** : 0 In all other cases

31. Consider the following reaction:



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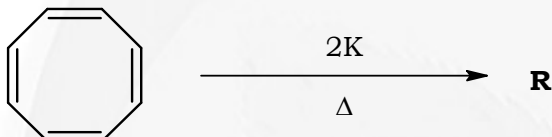
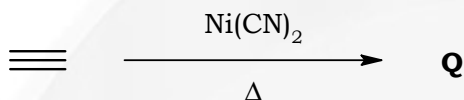
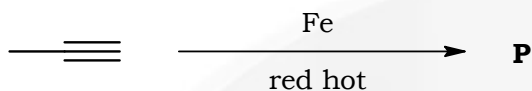
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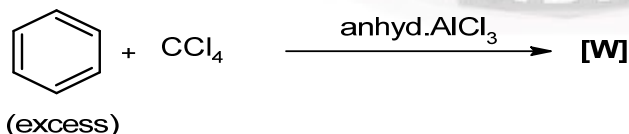
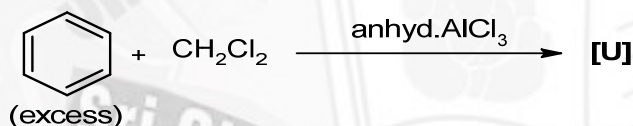
The mass (in g) of the chief organic product [P] is  
[Atomic masses: H = 1, C = 12, Na = 23, S = 32, Cl = 35.5]

32. Consider the major products of following reactions:



The sum of  $sp^2$  carbon atoms and the number of pi electrons not involved in resonance in P, Q, R and S is

33. Consider the following reactions:

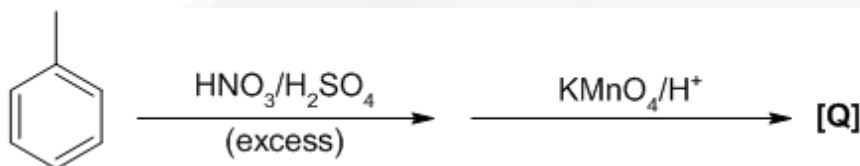
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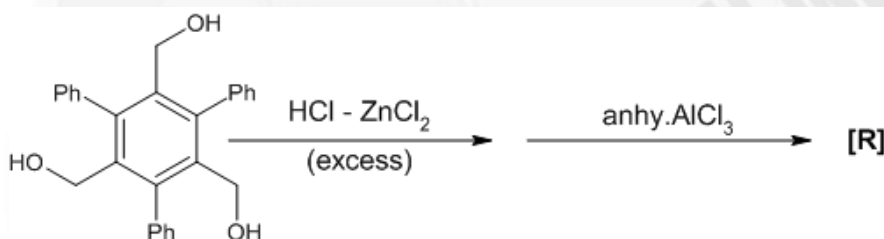


The sum of the number of  $sp^2$  hybridized carbon atoms and chlorine atoms across all the chief organic products [T], [U], [V] and [W] is

34. The number of heteroatoms in the organic product [Q] of the following reaction is [All atoms except C and H are heteroatoms]



35. The degree of unsaturation of compound [R] of the following reaction sequence is



36. The specific rotation of (+)-1-bromo-1-phenylethane changes from  $+15^\circ$  to  $-43^\circ$  on reaction with NaOH under strict  $S_N2$  conditions. When a sample of (-)-1-bromo-1-phenylethane was treated with aqueous NaOH, the resulting solution has a specific rotation of  $+10^\circ$ . The % of the reactant that underwent  $S_N2$  reaction is

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MARKS

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**MATHEMATICS****SECTION – I****(SINGLE CORRECT ANSWER TYPE)**

This section contains **SIX** (06) questions.

- Each question has **FOUR** options. **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated **according to the following marking scheme:**

**Full Marks :** +3 If **ONLY** the correct option is chosen;

**Zero Marks :** 0 If none of the options is chosen (i.e. the question is unanswered);

**Negative Marks :** -1 In all other cases

37. Let  $f(x) = x + \frac{2}{1.3}x^3 + \frac{2.4}{1.3.5}x^5 + \frac{2.4.6}{1.3.5.7}x^7 + \dots \forall x \in (0,1)$

consider  $\int f(x) dx = g(x) + C$  (where C is constant of integration) and  $g\left(\frac{1}{2}\right) = \frac{\pi^2}{72}$  then

the value of  $g\left(\frac{1}{\sqrt{2}}\right)$  is

- A)  $\frac{\pi^2}{32}$       B)  $\frac{\pi^2}{8}$       C)  $\frac{\pi^2}{18}$       D)  $\frac{\pi^2}{200}$

38. If  $\int \frac{(3x^{10} + 2x^8 - 2)\sqrt[4]{x^{10} + x^8 + 1}}{x^6} dx = f(x) + C$  (where C is constant of integration,  $x >$

0) and  $f(1) = \frac{6\sqrt[4]{3}}{5}$  then the value of  $\frac{(80f(2))^{\frac{4}{5}}}{183}$  is

- A) 1      B) 4      C) 7      D) 10

39. If  $\int \frac{(1 + x \cos x - \sin x) dx}{(x + \sin x + \cos x)^{\frac{1}{2}} (x - \sin x + \cos x)^{\frac{3}{2}}} = (x + \ell \sin x + m \cos x)^n (x + p \sin x + q \cos x)^r + C$

(where C is constant of integration and  $\ell, n > 0$ ) then the value of  $\left(\frac{\ell + m}{n}\right)(p - q)r$  is

equal to

- A) 2      B) 4      C) 6      D) 8





40. If  $x \in (0,1)$  and  $\int \sqrt{x} \tan \left( 2 \tan^{-1} \left( \frac{\sqrt{\sqrt{1+\sqrt{x}}+1} - \sqrt{\sqrt{1+\sqrt{x}}-1}}{\sqrt{\sqrt{1+\sqrt{x}}+1} + \sqrt{\sqrt{1+\sqrt{x}}-1}} \right) \right) dx = Ax^B + C$ , then (A,

B are positive constants and C is constant of integration)

A)  $A + B = \frac{21}{20}$     B)  $A + B = \frac{13}{6}$     C)  $AB = 1$     D)  $A - B = 1$

41. The value of the integral  $\int \frac{\sin \theta \cdot \sin 2\theta (\sin^6 \theta + \sin^4 \theta + \sin^2 \theta) \sqrt{2 \sin^4 \theta + 3 \sin^2 \theta + 6}}{1 - \cos 2\theta} d\theta$

is: (where C is a constant of integration)

A)  $\frac{1}{18} \left[ 11 - 18 \sin^2 \theta + 9 \sin^4 \theta - 2 \sin^6 \theta \right]^{\frac{3}{2}} + C$

B)  $\frac{1}{18} \left[ 9 - 2 \cos^6 \theta - 3 \cos^4 \theta - 6 \cos^2 \theta \right]^{\frac{3}{2}} + C$

C)  $\frac{1}{18} \left[ 9 - 2 \sin^6 \theta - 3 \sin^4 \theta - 6 \sin^2 \theta \right]^{\frac{3}{2}} + C$

D)  $\frac{1}{18} \left[ 11 - 18 \cos^2 \theta + 9 \cos^4 \theta - 2 \cos^6 \theta \right]^{\frac{3}{2}} + C$

42.  $\int \frac{\sin \frac{5x}{2}}{\sin \frac{x}{2}} dx$  is equal to : (where c is a constant of integration)

A)  $2x + \sin x + 2 \sin 2x + c$

B)  $x + 2 \sin x + 2 \sin 2x + c$

C)  $x + 2 \sin x + \sin 2x + c$

D)  $2x + \sin x + \sin 2x + c$

### SECTION – II (ONE OR MORE CORRECT ANSWER TYPE)

- This section contains **SIX** (06) questions.
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720  
MARKS







43.  $\int \frac{(x-2)dx}{\sqrt{x^4 - 8x^3 + 18x^2 - 8x + 1}} = f(x) + C \left( x > 2 + \sqrt{3} \right)$  and  $f(4) = 0$  then which is/are

**CORRECT?** (C is constant of integration)

- A) Number of solutions of  $f(x) = x^2$  is 2  
 B) Number of solutions of  $f(x) = \sqrt{x}$  is 1  
 C) Number of solutions of  $f(x) = \sqrt{1-x^2}$  is 2  
 D) Number of solutions of  $f(x) = x^{\frac{1}{3}}$  is 2

44. If  $\int \frac{dx}{\left(x + \sqrt{x(1+x)}\right)^2} = 2f(x) + g(x) + C$  where C is constant of integration. Given

$f(-1) = 0, g(-1) = -1$  then which of the following is/are **TRUE**?

- A)  $\lim_{x \rightarrow \infty} f(x) = \ln\left(\frac{1}{2}\right)$       B)  $\lim_{x \rightarrow \infty} f(x) = \ln 2$   
 C)  $\lim_{x \rightarrow \infty} g(x) = 0$       D)  $\lim_{x \rightarrow \infty} g(x) = 1$

45. The value of the integral is  $\int \frac{(\cos x - \sin x)dx}{(1 + \cos x)\cos x + \cos x \sin x + (1 + \sin x)\sin x}$  (C is constant of integration)

- A)  $\frac{\cos \frac{x}{2} - \sin \frac{x}{2}}{\sin \frac{x}{2} + \cos \frac{x}{2}} + C$     B)  $\frac{1 - \tan \frac{x}{2}}{1 + \cot \frac{x}{2}} + C$     C)  $\frac{1 + \cot \frac{x}{2}}{1 + \tan \frac{x}{2}} + C$     D)  $\frac{2 + \cot \frac{x}{2} - \tan \frac{x}{2}}{1 + \cot \frac{x}{2}} + C$

46. If  $\int \frac{x^3 + x + 1}{x^4 + x^2 + 1} dx = \frac{1}{2}f(x) + \frac{1}{\sqrt{3}}g(x) + C$ , C is constant of integration. Given

$f(0) = 0, g(1) = \frac{\pi}{6}$  then which of the following is/are **TRUE**?

- A)  $f(1) = \ln 2$       B)  $f(2) = \ln 7$       C)  $g(2) = \frac{\pi}{3}$       D)  $g(-2) = \frac{-\pi}{3}$



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47. If  $(x - y + 3)^2 = x + y$  then  $\int \frac{dx}{x + y + 6}$  is equal to (C is constant of integration)

- A)  $\frac{1}{2} \log(x + y + 3) + \frac{1}{2\sqrt{6}} \tan^{-1}\left(\frac{x + y + 6}{\sqrt{6}}\right) + C$
- B)  $\frac{1}{2} \log((x - y + 3)^2 + 6) + \frac{1}{2\sqrt{6}} \tan^{-1}\left(\sqrt{\frac{x + y}{6}}\right) + C$
- C)  $\frac{1}{2} \log(x + y + 6) + \frac{1}{2\sqrt{6}} \tan^{-1}\left(\frac{x - y + 3}{\sqrt{6}}\right) + C$
- D)  $\frac{1}{2} \log(x - y + 3) + \frac{1}{2\sqrt{6}} \tan^{-1}\left(\frac{x - y + 3}{\sqrt{6}}\right) + C$

48.  $\int e^{\tan x} \sqrt{\sec x + \tan x} (2 \sec x + 1) \sec x dx = e^{\tan x} \sqrt{f(x)} + C$ , then which of the following is/are FALSE? (C is constant of integration)

- A)  $f(0) = 4$
- B)  $f\left(\frac{\pi}{3}\right) = \frac{4}{\sqrt{3}} + 8$
- C)  $f(\pi/4) = 4 + 2\sqrt{8}$
- D)  $f\left(\frac{-\pi}{6}\right) = -4\sqrt{3} - \frac{2}{\sqrt{3}}$

### SECTION - III (NUMERICAL VALUE TYPE)

- This section contains **SIX (06)** questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.
- Answer to each question will be evaluated **according to the following marking scheme**:  
**Full Marks** : +4 If ONLY the correct numerical value is entered;  
**Zero Marks** : 0 In all other cases

49. For real numbers  $\alpha, \beta, \gamma$  and  $\delta$ , if  $\int \frac{(x^2 - 1) + \tan^{-1}\left(\frac{x^2 + 1}{x}\right)}{(x^4 + 3x^2 + 1) \tan^{-1}\left(\frac{x^2 + 1}{x}\right)} dx$

$$= \alpha \log_e \left( \tan^{-1}\left(\frac{x^2 + 1}{x}\right) \right) + \beta \tan^{-1}\left(\frac{\gamma(x^2 - 1)}{x}\right) + \delta \tan^{-1}\left(\frac{x^2 + 1}{x}\right) + C$$

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720**  
MARKS



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where  $C$  is an arbitrary constant, then the value of  $10(\alpha + \beta\gamma + \delta)$  is equal to \_\_\_\_\_

$(\alpha, \beta, \gamma, \delta \in R)$

50.  $\int \frac{x^2 + 4x - 1}{(x^2 + 3)^2 \sqrt{x + 3}} dx = f(x) + C$ , and  $f(1) = \frac{-1}{3}$  then the value of  $\frac{-39f(6)}{4}$  is equal to

\_\_\_\_\_ ( $C$  is constant of Integration)

51.  $\int e^x \left( \frac{x^4 + 4x^3 + 64}{(x + 4)^2} \right) dx = e^x f(x) + C$ , Given  $f(0) = 6$  then the value of  $7f(3)$  is \_\_\_\_\_

( $C$  is constant of integration)

52. Let  $\int \left( \frac{(x^4 + 1)}{(x^4 + 2)^{\frac{3}{4}}} \right) dx = f(x) + C$  and  $f(0) = 0$  then  $(\sqrt{2}f(\sqrt{2}))^8$  is equal to \_\_\_\_\_

53.  $\int \frac{(5x^2 + 2)dx}{25x^4 - 4\sqrt{5}x + 3} = Af(x) - Bg(x) + C$  where  $A, B$  are positive constants and  $C$  is

constant of integration. Given  $f\left(\frac{-1}{\sqrt{5}}\right) = 0$ ,  $g(0) = -1 \left[ 4 < \frac{1}{B} < 5, 6 < \frac{1}{A} < 7 \right]$ .

The value of  $f\left(\frac{\sqrt{2}-1}{\sqrt{5}}\right) + g\left(\frac{2}{\sqrt{5}}\right)$  is  $\frac{a+\pi}{b}$  ( $a, b \in N$ ) then  $a^2 + b$  is \_\_\_\_\_

54.  $\int \frac{(x^2 + 1)dx}{x\sqrt{x^2 + 2x - 1}\sqrt{1 - x - x^2}} = f(x) + C$ ,  $f\left(\frac{1}{2}\right) = \frac{\pi}{2}$  then the value of  $\left[ f\left(\frac{\sqrt{89}-5}{8}\right) \right]$

is \_\_\_\_\_ (where  $[.]$  denotes GIF) ( $C$  is constant of integration)







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RANK  
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RANK  
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RANK  
**84**

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RANK  
**87**

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RANK  
**92**

**SAMOTA APURVA**  
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RANK  
**97**

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BELOW  
**20**  
All India Open  
Category Ranks

**10**  
RANKS (50%)

BELOW  
**100**  
All India Open  
Category Ranks

**32**

BELOW  
**1000**  
All India Open  
Category Ranks

**181**

BELOW  
**100**  
All India  
Category Ranks  
Count

**89**

BELOW  
**1000**  
All India  
Category Ranks  
Count

**699**

NUMBER OF RANKS QUALIFIED  
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