

# FIITJEE RET – 4

EXTENDED\_2019

IIT-2015 (P1)

DATE: 13.08.2018

Time: 3 hours

Maximum Marks: 264

## INSTRUCTIONS:

### A. General

1. This booklet is your Question Paper containing 60 questions.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. Fill in the boxes provided for Name and Enrolment No.
4. The answer sheet, a machine-readable Objective Response (ORS), is provided separately.
5. DO NOT TAMPER WITH / MULTILATE THE ORS OR THE BOOKLET.

### B. Filling in the OMR:

6. The instructions for the OMR sheet are given on the OMR itself.

### C. Question paper format:

7. The question paper consists of **3 parts (Physics, Chemistry and Mathematics)**. Each part consists of **two sections**.
8. **Section I** contains **8 questions**. The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).
9. **Section II** contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** are correct.
10. **Section III** contains **2 Match the following** type questions and you will have to match entries in Column I with the entries in Column II

### D. Marking Scheme

11. For each question in **Section I**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answers in this section.
12. For each question in **Section II**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **-2 marks** will be awarded for incorrect answers in this section.
13. For each question in **Section III**, you will be awarded **2 marks** for each entry in Column I; if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **-1 marks** will be awarded for incorrect answers in this section.

Don't write / mark your answers in this question booklet.

If you mark the answers in question booklet, you will not be allowed to continue the exam.

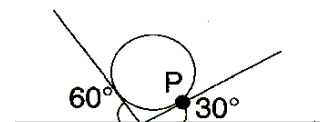
NAME:

ENROLLMENT NO.:

**PAPER-I**  
**PART I: PHYSICS**  
**SECTION 1 (Maximum Marks: 32)**

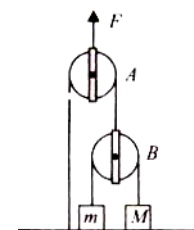
- ◆ This section contains **EIGHT** questions.
- ◆ The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- ◆ For each question, darken the bubble corresponding to the correct integer in the ORS.
- ◆ Marking scheme:
  - +4** If the bubble corresponding to the answer is darkened.
  - 0** In all other cases.

1. A sphere of mass  $\frac{1}{\sqrt{3}}$  kg is placed on two inclined planes of angle  $30^\circ$  and  $60^\circ$  with horizontal, as shown. Find the normal reaction at point P (in Newton)

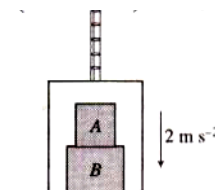


2. In a smooth hemispherical shell of radius R, a rod of mass  $\left(\frac{\sqrt{3}}{2}\right)$  kg is placed horizontally and is in equilibrium. The length of rod is R. Find the normal reaction at any end of the rod (in Newton). (Take  $g = 10\text{m/s}^2$ )

3. Two blocks of mass  $m = 10$  kg and  $M = 20$  kg are connected by a string passing over a pulley B as shown in the figure. Another string connects the centre of pulley B and passes over another pulley A as shown. An upward force F is applied at the centre of pulley A. Both the pulleys are massless. When F is 600 N, then The acceleration of mass m is \_\_\_\_\_

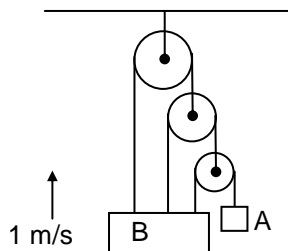


4. The elevator shown in fig is descending with an acceleration of  $2\text{ms}^{-2}$ . The mass of the block A = 0.5 kg. Find the force (in Newton) exerted by block A on block B.

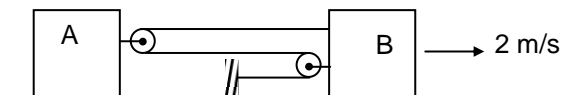


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5. Find the value of velocity of 'A'

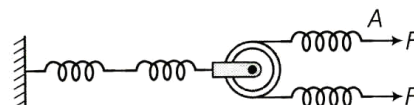


6. Find the value of velocity of 'A'



7. A smooth sphere of weight 'W' is supported in contact with a smooth vertical wall by a string to a point on its surface, the end being attached to a point on the wall. If the length of the string is equal to the radius of the sphere, then the tension in the string is  $T = \frac{kW}{\sqrt{3}}$ . The value of "k" is \_\_\_\_\_ (the line of string passes through centre of the sphere)

8. For the system shown in the figure, pulley is smooth and light. Each spring has spring constant  $k = 100 \text{ N/m}$ . The least force  $F = 100 \text{ N}$  is required to shift the point A through a distance  $x_0$ . Find the value of  $x_0$ .

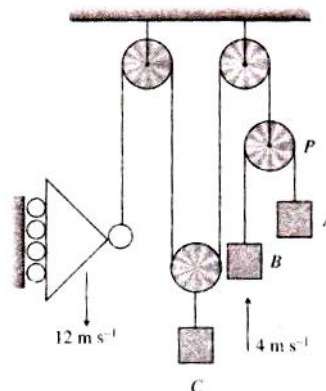


### SECTION 2 (Maximum Marks: 40)

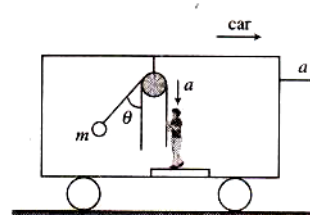
- ◆ This section contains **TEN** questions.
- ◆ Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- ◆ For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- ◆ Marking scheme:
  - +4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  - 0** If none of the bubbles is darkened.
  - 2** In all other cases

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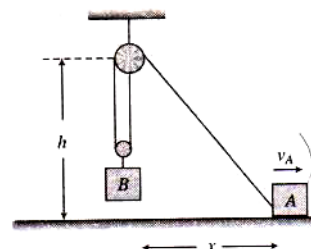
9. In the arrangement shown in fig at a particular instant, the roller is coming down with a speed of  $12 \text{ ms}^{-1}$  and C is moving up with  $4 \text{ ms}^{-1}$ . At the same instant, it is also known that w.r.t pulley P, block A is moving down with speed  $3 \text{ ms}^{-1}$ . Determine the motion of block B (velocity) w.r.t ground.
- (A)  $4 \text{ ms}^{-1}$  in downward direction  
 (B)  $3 \text{ ms}^{-1}$  in upward direction  
 (C)  $7 \text{ ms}^{-1}$  in downward direction  
 (D)  $7 \text{ ms}^{-1}$  in upward direction



10. A bob is hanging over a pulley inside a car through a string. The second end of the string is in the hands of a person standing in the car. The car is moving with constant acceleration  $a$  directed horizontally as shown in fig. The other end of the string is pulled with constant acceleration  $a$  vertically. The tension in the string is equal to
- (A)  $m\sqrt{g^2 + a^2}$                       (B)  $m\sqrt{g^2 + a^2} - ma$   
 (C)  $m\sqrt{g^2 + a^2} + ma$               (D)  $m(g + a)$

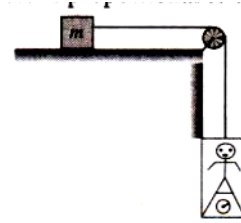


11. If block A is moving horizontally with velocity  $v_A$ , then find the velocity of block B at the instant as shown in fig.
- (A)  $\frac{hv_A}{2\sqrt{x^2 + h^2}}$                       (B)  $\frac{xv_A}{\sqrt{x^2 + h^2}}$   
 (C)  $\frac{xv_A}{2\sqrt{x^2 + h^2}}$                       (D)  $\frac{hv_A}{\sqrt{x^2 + h^2}}$



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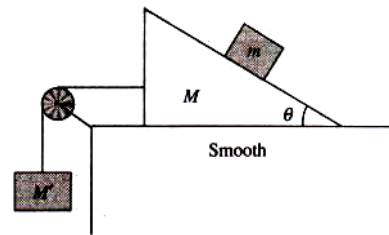
12. In fig, a man of true mass  $M$  is standing on a weighing machine placed in a cabin. The cabin is joined by a string with a body of mass  $m$ . Assuming no friction, and negligible mass of cabin and weighing machine, the measured mass of man is (normal force between the man and the machine is proportional to the mass)



- (A) The measured mass of man is  $\frac{Mm}{(M+m)}$       (B) The acceleration of man is  $\frac{mg}{(M+m)}$   
 (C) The acceleration of man is  $\frac{Mg}{(M+m)}$       (D) The measured mass of man is  $M$

13. Fig shows a block of mass  $m$  placed on a smooth wedge of mass  $M$ . Calculate the minimum value of  $M'$  and tension in the string, so that the block of mass  $m$  will move vertically downward with acceleration  $10ms^{-2}$

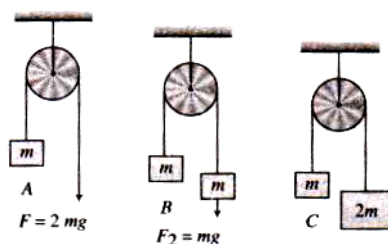
- (A) The value of  $M'$  is  $\frac{M \cot \theta}{1 - \cot \theta}$   
 (B) The value of  $M'$  is  $\frac{M \tan \theta}{1 - \tan \theta}$   
 (C) The value of tension in the string is  $\frac{Mg}{\tan \theta}$   
 (D) The value of tension is  $\frac{Mg}{\cot \theta}$



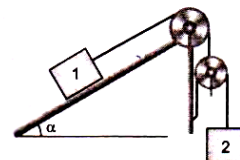
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14. In the fig, the block A,B and c of mass  $m$  each have acceleration  $a_1, a_2$  and  $a_3$ , respectively.  $F_1$  and  $F_2$  are external forces of magnitude  $2mg$  and  $mg$ , respectively then.

- (A)  $a_1 \neq a_2 \neq a_3$       (B)  $a_1 = a_2 \neq a_3$   
 (C)  $a_1 > a_2 > a_3$       (D)  $a_1 \neq a_2 = a_3$

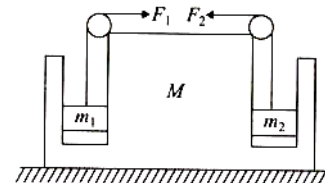


15. Consider the system as shown in fig. If mass of body 2 is  $\eta$  times as great as the mass of body 1 and the angle that the inclined plane forms with the horizontal is equal to  $\alpha$ . The masses of the pulleys and the threads, as well as the friction, are assumed to be negligible. Then



- (A) acceleration of body 2 is  $\frac{g(2\eta - \sin\alpha)}{(1 + 4\eta)}$  downward if  $\eta > \frac{\sin\alpha}{2}$   
 (B) acceleration of body 2 is  $\frac{2g(2\eta - \sin\alpha)}{(1 + 4\eta)}$  upward if  $\eta > \frac{\sin\alpha}{2}$   
 (C) acceleration of body 1 is  $\frac{2g(\sin\alpha - 2\eta)}{(1 + 4\eta)}$  down the inclined plane if  $\eta < \frac{\sin\alpha}{2}$   
 (D) For  $\eta = 2\sin\alpha$ , the system does not move.

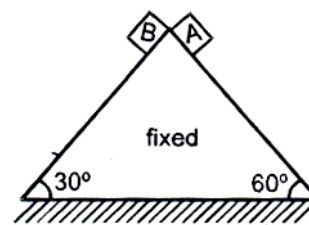
16. For the system shown in the figure, there is no friction anywhere. Masses  $m_1$  and  $m_2$  can move up or down in the slots cut in mass  $M$ . Two non-zero horizontal forces  $F_1$  and  $F_2$  ( $F_1 \neq F_2$ ) are applied as shown. The pulleys are massless and frictionless. Given  $m_1 \neq m_2$  then which of the following is / are correct



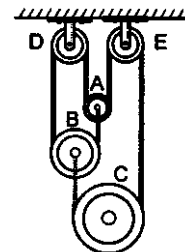
- (A) It is not possible for the entire system to be in equilibrium  
 (B) For some values of  $F_1$  and  $F_2$ , it is possible that entire system is in equilibrium  
 (C) It is possible that  $F_1$  and  $F_2$  are applied in such a way that  $m_1$  and  $m_2$  remain in equilibrium but  $M$  does not.  
 (D) None of the above

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17. Small blocks A and B are simultaneously released from apex of a smooth wedge as shown in figure. Select correct alternative(s)



- (A) Relative acceleration of block B with respect to block A is zero  
 (B) Magnitude of relative acceleration of block B with respect to block A is 'g' initially  
 (C) Speed of block A and B will be same at the bottom of inclined plane  
 (D) The time taken by A and B to reach the bottom of inclined plane will be same
18. In the pulley system shown in figure the movable pulleys A, B and C are of mass 1 kg each. V and Bare fixed pulleys. The strings are light and inextensible. Choose the correct alternative (s)
- (A) Tension in the string is 6.5 N  
 (B) Acceleration of pulley A is  $g/3$  downward  
 (C) Acceleration of pulley B is  $g/6$  upward  
 (D) Acceleration of pulley C is  $g/3$  upward



### SECTION 3 (Maximum Marks: 16)

- ◆ This section contains **TWO** questions.
- ◆ Each question contains two columns, **Column I** and **Column II**
- ◆ **Column I** has **four** entries (A), (B), (C) and (D)
- ◆ **Column II** has **five** entries (P), (Q), (R), (S) and (T)
- ◆ Match the entries in **Column I** with the entries in **Column II**
- ◆ One or more entries in **Column I** may match with one or more entries in **Column II**.
- ◆ The ORS contains a  $4 \times 5$  matrix whose layout will be similar to the one shown below:

(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)


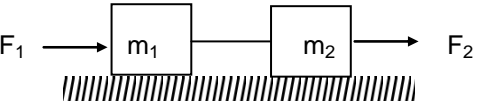
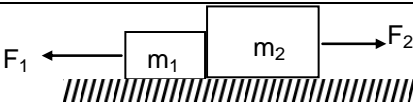
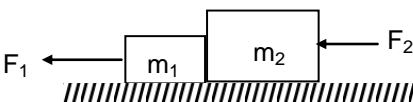
- ◆ For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- ◆ Marking entry in Column I.
  - +2** If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  - 0** If none of the bubbles is darkened.
  - 1** In all other cases.

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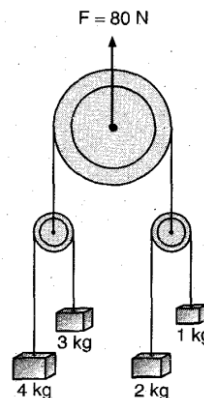
19 Column I gives four different situations involving two blocks of mass  $m_1$  and  $m_2$  placed in different ways on smooth horizontal surface as shown. In each of the situations, horizontal force  $F_1$  and  $F_2$  are applied on blocks of mass  $m_1$  and  $m_2$ , respectively and also  $m_2 F_1 < m_1 F_2$ . Match the statements in column I with the corresponding results in column II

	Column - I		Column - II
(A)	 <p>Both the blocks are connected by the massless inelastic string. The magnitude of tension in the string is</p>	(p)	$\frac{m_1 m_2}{m_1 + m_2} \left( \frac{F_1}{m_1} - \frac{F_2}{m_2} \right)$
(B)	 <p>Both the blocks are connected by the massless inelastic string. The magnitude of tension in the string is</p>	(q)	$\frac{m_1 m_2}{m_1 + m_2} \left( \frac{F_1}{m_1} + \frac{F_2}{m_2} \right)$
(C)	 <p>The magnitude of normal reaction between the blocks is</p>	(r)	$\frac{m_1 m_2}{m_1 + m_2} \left( \frac{F_2}{m_2} - \frac{F_1}{m_1} \right)$
(D)	 <p>The magnitude of normal reaction between the blocks is</p>	(s)	$m_1 m_2 \left( \frac{F_1 + F_2}{m_1 + m_2} \right)$
		(t)	Zero

Space for rough work



20. In the diagram shown in figure, all pulleys are smooth and massless and strings are light. Match the following (Take  $g = 10 \text{ ms}^{-2}$ )



Column-1		Column-2	
(A)	Acceleration of 1 kg block	(p)	$10 \text{ m/s}^2$ , upward
(B)	Acceleration of 2 kg block	(q)	$5 \text{ ms}^{-2}$ , downward
(C)	Acceleration of 3 kg block	(r)	Stationary
(D)	Acceleration of 4 kg block	(s)	$\frac{10}{3} \text{ ms}^{-2}$ , downwards

## PART II: CHEMISTRY

### SECTION 1 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** questions.
- ◆ The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- ◆ For each question, darken the bubble corresponding to the correct integer in the ORS.
- ◆ Marking scheme:
  - +4** If the bubble corresponding to the answer is darkened.
  - 0** In all other cases.

21. The formal charge on central oxygen atom in ozone is
22. The number of anti bonding electrons in  $\text{N}_2^-$  is
23. A list of species given below.  
 $\text{BF}_3$ ,  $\text{CHCl}_3$ ,  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{SnCl}_2$ ,  $\text{SO}_2$   
 The total number of species having zero value of dipole moment
24. How many compounds from the following list will not have any lone pair on central atom?  
 $\text{ClF}_3$ ,  $\text{XeO}_4$ ,  $\text{XeO}_3$ ,  $\text{OSF}_4$ ,  $\text{NH}_3$ ,  $\text{PCl}_5$

*Space for rough work*

25. Out of  $\ominus$   $\ominus$   
 $I_3, ICl_2, BeCl_2, XeF_2, XeF_6, BrF_5, HC \equiv CH$   
 How many will have linear shape?
26. How many of the following is correct regarding bond angle ?
- |                        |                                |
|------------------------|--------------------------------|
| (i) $NH_3 < H_3O^+$    | (ii) $F_2O < H_2O$             |
| (iii) $SCl_2 < OCl_2$  | (iv) $H_2S < H_2O$             |
| (v) $NO_2 < N_2O$      | (vi) $CH_3^{(-)} < CH_3^{(+)}$ |
| (vii) $NH_3 < CH_4$    | (viii) $BF_4^{(-)} < BF_3$     |
| (ix) $SnCl_2 < HgCl_2$ |                                |
27. A covalent molecule  $AX_3$  has T-shape structure. How many lone pairs are present in the molecule.
28. Identifying the no. of amphoteric oxides among the following  
 $BeO, Na_2O, SiO_2, BaO, ZnO, Al_2O_3, SnO, PbO, Cl_2O_7$ .

### SECTION 2 (Maximum Marks: 40)

- ◆ This section contains **TEN** questions.
- ◆ Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- ◆ For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- ◆ Marking scheme:
 

<b>+4</b>	If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
<b>0</b>	If none of the bubbles is darkened.
<b>-2</b>	In all other cases

29. A neutral white salt of sodium (P) on heating liberates a gas leaving a highly alkaline residue (Q) The gas 'A' is colourless, odourless and turns a solution of  $Ca(OH)_2$  milky. The compound  
 (A) P is  $NaHCO_3$       (B) Q is  $Na_2CO_3$       (C) A is  $CO_2$       (D) P is  $NH_4HCO_3$

*Space for rough work*

30. Correct statement(s) with respect to hydroxides of alkali metals  
 (A) All are soluble in  $H_2O$   
 (B) Basicity orders is  $CsOH > RbOH > KOH > NaOH$   
 (C) All can be used to remove mercaptans (sulphur containing compounds) from petroleum products because of acid–base reaction.  
 (D) Thermal stability increases down the group.
31. Which of the following illustrate the anomalous properties of lithium ?  
 (A) Lithium is much softer than the other group I metals  
 (B) Lithium forms a nitride,  $Li_3N$  unlike other group I metals  
 (C) The melting and boiling points of lithium are comparatively high  
 (D) The ions of lithium and its compounds are more heavily hydrated than those of the rest of the elements of the group.
32. Which of the following properties of compounds of alkaline earth metals is correctly matched?  
 (A) Thermal stability:-  $AlN > MgO > NaF$   
 (B) Solubility in water:-  $NaCl > MgCl_2 > BCl_3$   
 (C) Lattice energy:-  $BeO > MgO > CaO > BaO$ .  
 (D) Covalent character:-  $BeCl_2 > MgCl_2 > CaCl_2 > BaCl_2$ .
33. A  $\pi$ - bond can be formed between two  $p_x$  orbitals each having an unpaired electron, if they approach each other along:  
 (A) X-axis                      (B) Y-axis                      (C) Z-axis                      (D) Any direction
34.  $N_2$  and  $O_2$  are converted to monocations  $N_2^+$  and  $O_2^+$  respectively, which is correct statement :  
 (A) In  $N_2^+$ , the N–N bond weakens                      (B) In  $O_2^+$ , the O–O bond order increases  
 (C) In  $O_2^+$ , the paramagnetism decreases                      (D)  $N_2^+$  becomes diamagnetic
35. Which is correct statement  
 As the s–character of a hybrid orbitals decreases  
 (A) the bond angle decreases                      (B) the bond strength decreases  
 (C) the bond length increases                      (D) size of orbital increases
36. Which is correct  
 (A) during  $N_2^+$  formation, one electron is removed from the bonding molecule orbital of  $N_2$ .  
 (B) during  $O_2^+$  formation, one electron is removed from the antibonding molecular orbital of  $O_2$ .  
 (C) during  $O_2^-$  formation one electron is added the bonding molecule orbital of  $O_2$ .  
 (D) during  $CN^-$  formation , one  $e^-$  is added to bonding molecular orbital of CN

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**Space for rough work**

37. The compound / species in which d – orbital is not involved in central atom hybridization  
 (A)  $\text{POCl}_3$  (B)  $\text{SOF}_4$  (C)  $\text{XeOF}_2$  (D)  $\text{IF}_2^+$
38. Which of the following affects the electro negativity of an atom  
 (A) effective nuclear charge  
 (B) Multiplicity of bond between atoms  
 (C) Oxidation number  
 (D) The number of neutrons in the nucleus

### SECTION 3 (Maximum Marks: 16)

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- ◆ Each question contains two columns, **Column I** and **Column II**
- ◆ **Column I** has **four** entries (A), (B), (C) and (D)
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(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)

- ◆ For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- ◆ Marking entry in Column I.
  - +2** If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  - 0** If none of the bubbles is darkened.
  - 1** In all other cases.

39.

Column – I		Column – II	
(A)	C–H bond in ethyne	(p)	sp–s overlap
(B)	P–Cl bond in $\text{POCl}_3$	(q)	$\text{sp}^3\text{d}$ –p overlap
(C)	Br–Br bond in $\text{Br}_3^{(-)}$	(r)	$\text{sp}^3$ –p overlap
(D)	C–C bond in ethane	(s)	$\text{sp}^3$ – $\text{sp}^3$ overlap

*Space for rough work*

40.

Column – I (molecule/ ion)		Column – II (Bond angle)	
(A)	$P_4$	(p)	$180^\circ$
(B)	$ICl_2^{(-)}$	(q)	$109^\circ 28'$
(C)	$XeF_6$	(r)	$60^\circ$
(D)	$BF_4^{(-)}$	(s)	$90^\circ$

### PART III: MATHEMATICS

#### SECTION 1 (Maximum Marks: 32)

- ◆ This section contains **EIGHT** questions.
- ◆ The answer to each question is a **SINGLE DIGIT INTEGER** ranging from **0 to 9**, both inclusive.
- ◆ For each question, darken the bubble corresponding to the correct integer in the ORS.
- ◆ Marking scheme:
  - +4** If the bubble corresponding to the answer is darkened.
  - 0** In all other cases.

41. If  $g(x) = \cos^{-1}\{3 - (x - 5)\}^{1/5}$ , then its inverse is  $g^{-1}(x) = 5 + (3 + \cos^5 x)^{1/k}$ , find the value of 'k'
42. For  $\lim_{x \rightarrow 0} \frac{1}{x^2} (e^{\alpha x} - e^x - x) = \frac{3}{2}$ , 'α' cannot take the value
43. If  $F(x) + F\left(\frac{x-1}{x}\right) = 1 + x \quad \forall x \neq 0, x \neq 1$ , where  $F(0), F(1)$  are not defined, then  $F(2) = \frac{k}{4}$ , The value of 'k' is
44.  $f(x) = x^2 - 5x + 6$ ,  $g(x) = f(|x|)$ ,  $h(x) = |g(x)|$ , find the number of solutions of equation  $g(x) = 0$ .
45. If  $f(x) = 1 - x^3 - x^4 - 2x^5 = g(x) + h(x)$ , where  $g$  is an even function and  $h$  is an odd function. Then find the value of  $\frac{h(-5)}{5^2 \cdot 51}$ .

*Space for rough work*

46.  $\lim_{x \rightarrow 0} \frac{x \tan 2x - 2x \tan x}{(1 - \cos 2x)^2} = \frac{1}{\lambda}$ , where  $\lambda$  is
47. Let  $\alpha, \beta \in \mathbb{R}$  be such that  $\lim_{x \rightarrow 0} \frac{x^2 \sin \beta x}{\alpha x - \sin x} = 1$ , then  $6(\alpha + \beta)$  equals
48. A circle is inscribed in an equilateral triangle of side 6. The area of any square inscribed in the circle is

### SECTION 2 (Maximum Marks: 40)

- ◆ This section contains **TEN** questions.
- ◆ Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- ◆ For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- ◆ Marking scheme:
  - +4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  - 0** If none of the bubbles is darkened.
  - 2** In all other cases

49. The range of  $f(x) = \sqrt{2-x} + \sqrt{1+x}$  is
- (A)  $[\sqrt{3}, \sqrt{6}]$       (B)  $[\frac{3}{2}, 2]$       (C)  $[2, \frac{23}{10}]$       (D)  $(\frac{3}{2}, 2)$
50. Let  $g(x)$  be a real valued function defined as  $g(x) = [e^{|\sin p \pi x|}]$  where  $p$  is a positive integer and  $[x]$  represents greatest integer less than or equal to  $x$ , then
- (A) Domain of  $f(x)$  is  $\mathbb{R}$       (B) Period of  $f(x)$  is  $\frac{1}{p}$
- (C)  $f(x)$  is not periodic      (D) Range of  $f(x)$  is  $\{1, 2\}$
51. Let  $f(x) = [x]^2 + [x + 1] - 3$ , where  $[x] =$  the greatest integer  $\leq x$ . Then
- (A)  $f(x)$  is a many-one and into function      (B)  $f(x) = 0$  for infinite number of values of  $x$
- (C)  $f(x) = 0$  for only two real values      (D) none of these

**Space for rough work**

52. Consider a real valued function  $f(x)$  satisfying  $2 f(xy) = (f(x))^y + (f(y))^x$  for all  $x, y \in \mathbb{R}$  and  $f(1) = a$  where  $a \neq 1$ , then
- (A)  $(a-1) \sum_{i=1}^n f(i) = a^{n+1} - a$  (B)  $f(x) = (a-1)a^{2x}$   
 (C)  $f(x) = a^x$  (D)  $f(x) = a^{2x}$
53. The range of  $f(x) = \log_2 \left( \frac{\sin x - \cos x + 3\sqrt{2}}{\sqrt{2}} \right)$  cannot be
- (A) (1, 2) (B) (2, 3) (C) (3, 5) (D) (1, 2)
54. The  $\lim_{x \rightarrow 0} x^8 \left[ \frac{1}{x^3} \right]$  is  
 (where  $[.]$  denotes greatest integer function)
- (A) an integer (B) zero  
 (C) a rational number (D) a non-zero real number
55. If  $\lim_{x \rightarrow 0} \frac{x(1 + a \cos x) - b \sin x}{x^3} = 1$ , then
- (A)  $a = \frac{3}{2}$  (B)  $a = -\frac{5}{2}$  (C)  $a - b = -1$  (D)  $b - a = \frac{5}{6}$
56. Equation of tangents drawn from the origin to the circle  $x^2 + y^2 - 2rx - 2hy + h^2 = 0$  are
- (A)  $x = 0$  (B)  $y = 0$   
 (C)  $(h^2 - r^2)x - 2rhy = 0$  (D)  $(h^2 - r^2)x + 2hxy = 0$
57. Circle(s) touching x-axis at a distance 3 from the origin and having an intercept of length  $2\sqrt{7}$  on y-axis is (are)
- (A)  $x^2 + y^2 - 6x + 8y + 9 = 0$  (B)  $x^2 + y^2 - 6x + 7y + 9 = 0$   
 (C)  $x^2 + y^2 - 6x - 8y + 9 = 0$  (D)  $x^2 + y^2 - 6x - 7y + 9 = 0$
58. The centre of circle inscribed in square formed by the lines  $x^2 - 8x + 12 = 0$  and  $y^2 - 14y + 45 = 0$ , is
- (A) (4, 7) (B) (7, 4) (C) (9, 4) (D) (4, 9)

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**Space for rough work**

## SECTION 3 (Maximum Marks: 16)

- ◆ This section contains **TWO** questions.
- ◆ Each question contains two columns, **Column I** and **Column II**
- ◆ **Column I** has **four** entries (A), (B), (C) and (D)
- ◆ **Column II** has **five** entries (P), (Q), (R), (S) and (T)
- ◆ Match the entries in **Column I** with the entries in **Column II**
- ◆ One or more entries in **Column I** may match with one or more entries in **Column II**.
- ◆ The ORS contains a  $4 \times 5$  matrix whose layout will be similar to the one shown below:

(A)	(P)	(Q)	(R)	(S)	(T)
(B)	(P)	(Q)	(R)	(S)	(T)
(C)	(P)	(Q)	(R)	(S)	(T)
(D)	(P)	(Q)	(R)	(S)	(T)

- ◆ For each entry in Column I, darken the bubbles of all the matching entries. For example, if entry (A) in **Column I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (V), (C) and (D).
- ◆ Marking entry in Column I.
  - +2** If only the bubble(s) corresponding to all the correct match (s) is (are) darkened.
  - 0** If none of the bubbles is darkened.
  - 1** In all other cases.

59. Match the following

Column I (Functions)		Column II (Values of x for which both the functions in any option of the column I are identical)	
(A)	$f(x) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$ , $g(x) = 2 \tan^{-1}x$	p.	$x \in \{-1, 1\}$
(B)	$f(x) = \sin^{-1}(\sin x)$ and $g(x) = \sin(\sin^{-1}x)$	q.	$x \in [-1, 1]$
(C)	$f(x) = \log_{x^2} 25$ and $g(x) = \log_x 5$	r.	$x \in (-1, 1)$
(D)	$f(x) = \sec^{-1}x + \operatorname{cosec}^{-1}x$ , $g(x) = \sin^{-1}x + \cos^{-1}x$	s.	$x \in (0, 1)$

*Space for rough work*



60. Match the following

Column I		Column II	
(A)	If $f(x)$ is a polynomial satisfying $2 + f(x)f(y) = f(x) + f(y) + f(xy)$ for all real $x$ and $y$ and $f(2) = 5$ , then $\lim_{x \rightarrow 2} f(x)$ is	p.	$\frac{1}{2}$
(B)	The value of $A$ , so that the function $f(x) = \begin{cases} \frac{2^{x+2} - 16}{4^x - 16}, & x \neq 2 \\ A & \text{if } x = 2 \end{cases}$ is continuous is equal to	q.	5
(C)	If $f(x) = 2 \left\{ \frac{\log(1+x)^{1+x}}{x^2} - \frac{1}{x} \right\}$ , $x \neq 0$ , then the value of $f(0)$ , So that $f$ is continuous at $x = 0$ is	r.	2
(D)	$\lim_{x \rightarrow 0} \frac{1}{x} \sin^{-1} \left( \frac{2x}{1+x^2} \right)$ is equal to	s.	1

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**Space for rough work**

# FIITJEE RET – 4

EXTENDED\_2019

IIT-2015 (P1)

DATE: 13.08.2018

ANSWERS

## PHYSICS

- |                                |           |                        |         |
|--------------------------------|-----------|------------------------|---------|
| 1. 5                           | 2. 5      | 3. 5                   | 4. 4    |
| 5. 7                           | 6. 3      | 7. 2                   | 8. 5    |
| 9. D                           | 10. C     | 11. C                  | 12. A,C |
| 13. A,C                        | 14. A,C   | 15. Bonus              | 16. A   |
| 17. B,C                        | 18. A,B,D | 19. A-q, B-r, C-t, D-r |         |
| 20. A → p, B → r, C → s, D → q |           |                        |         |

## CHEMISTRY

- |                                   |             |             |             |
|-----------------------------------|-------------|-------------|-------------|
| 21. 1                             | 22. 5       | 23. 3       | 24. 3       |
| 25. 5                             | 26. 9       | 27. 2       | 28. 5       |
| 29. A, B, C                       | 30. A, B, C | 31. B, C, D | 32. B, C, D |
| 33. B, C                          | 34. A, B, C | 35. A, B, C | 36. A, B, D |
| 37. A, D                          | 38. A, B, C |             |             |
| 39. A → p ; B → r ; C → q ; D → s |             |             |             |
| 40. A → r ; B → p ; C → s ; D → q |             |             |             |

## MATHEMATICS

- |                                |         |  |        |
|--------------------------------|---------|--|--------|
| 41. 1                          | 42. 2   | 43. 3                                      | 44. 4  |
| 45. 5                          | 46. 2   | 47. 7                                      | 48. 6  |
| 49. AC                         | 50. ABD | 51. AB                                     | 52. AC |
| 53. BCD                        | 54. ABC | 55. BC                                     | 56. AD |
| 57. AC                         | 58. A   | 59. A → r, s; B → p, q, r, s; C → s; D → p |        |
| 60. A → q; B → p; C → s; D → r |         |  |        |