FIITJEE RET – 9

(2017 – 2019)(2ND YEAR_CHAMPIONS)

IIT-2017 (P2)

DATE: 10.09.2018

Time: 3 hours **Maximum Marks: 183**

INSTRUCTIONS:

A. General

1. This booklet is your Question Paper containing 54 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 & Marking Scheme

7. Each part has three sections as detailed in the following table:

Section	Question Type	Number of Questions	Category wise Marks Each Question				Maximum marks of the section
			Full Marks	Partial Marks	Zero Marks	Negative Marks	
1	**Single Correct Option**	7	**+3** If only the bubble corresponding to the correct option is darkened	——	**0** If none of the bubbles is darkened	**–1** In all other cases	**21**
2	**One or more correct option(s)**	7	**+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.	**+1** For darkening a bubble corresponding to each correct option, provided **NO** incorrect option is darkened.	**0** If none of the bubbles is darkened.	**–2** In all other case.	**28**
3	**Comprehension**	4	**+3** If only the bubble corresponding to the correct option is darkened	——	**0** In all other case.	——	**12**

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.

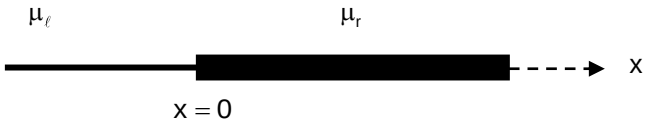
NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐☐☐

PAPER–II
PART I: PHYSICS
SECTION 1 (Maximum Marks: 28)

* This section contains **SEVEN** questions.
* Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
* For each question, darken the bubble corresponding to all the correct option in the ORS.

1. A string consists of two parts attached at x =0. The right part of the string (x >0) has mass μ_r per unit length and the left part of the string (x < 0) has mass μ_ℓ per unit length. The string tension is T. If a wave of unit amplitude travels along the left part of the string, as show in the figure, what is the amplitude of the wave that is transmitted to the right part of the string.



(A) 1 (B) $\frac{\sqrt{\mu_\ell/\mu_r}-1}{\sqrt{\mu_\ell/\mu_r}+1}$ (C) $\frac{2\sqrt{\mu_\ell/\mu_r}}{1+\sqrt{\mu_\ell/\mu_r}}$ (D) $\frac{2}{1+\sqrt{\mu_\ell/\mu_r}}$

2. A composite string is made up by joining two strings of different masses per unit length $\rightarrow \mu$ and 4μ. The composite string is under the same tension. A transverse wave pulse Y = (6 mm) $\sin(5t+40x)$, where 't' is in second and 'x' is in metres is sent along the lighter string towards the joint. The joint is at x =0. The equation of the wave pulse reflected from the joint is
(A) (4 mm) sin (40x – 5t) (B) (2 mm) sin (5t – 40x)
(C) (2 mm) sin (5t – 10x) (D) -(2 mm) sin (5t – 40x)

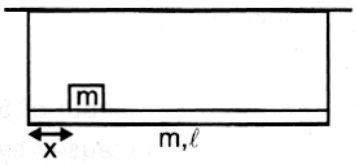
3. A standing wave exists in a string of length 150 cm which is fixed at both ends with rigid supports. The displacement amplitude of a point at a distance of 10 cm from one of the ends is $5\sqrt{3}$ mm. The distance between the two nearest points, with in same loop and having displacement amplitude equal to $5\sqrt{3}$ mm is 10 cm. Find the maximum displacement amplitude of the particles in the string
(A) 20 mm (B) 15 mm (C) 10 mm (D) None of these

4. A uniform rope having linear density λ hangs vertically from the ceiling and its lower end is free. A disturbance produced at the free end has a speed v_0 at point P midway on the rope. Then, the time taken by the disturbance pulse to reach the ceiling is.
(A) $\frac{4v_0}{g}$ (B) $\frac{2\sqrt{2}v_0}{g}$ (C) $\frac{2v_0}{g}$ (D) $\frac{\sqrt{2}v_0}{g}$

Space for rough work

5. A rod (m,ℓ) is hanging with a help of 2 strings and a particle of mass 'm' is kept at a distance 'x' from left end as shown in the diagram

What is the value of 'x' such that 3rd harmonic of left string is resonating with 4th harmonic of right string

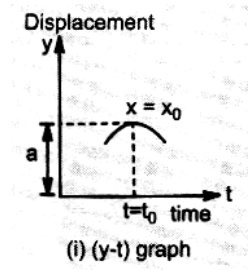


(A) $\frac{11\ell}{50}$ (B) $\frac{\ell}{5}$

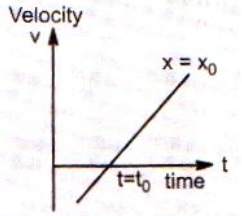
(C) $\frac{2\ell}{7}$ (D) $\frac{\ell}{7}$

6. A progressive simple harmonic wave is moving in air along the x – axis. The part of this wave at a given point $x = x_0$ from the source and at a certain instant $t = t_0$ has the waveform shown below in the displacement (y-t) time graph and velocity (v-t) time graph respectively.

Velocity of the wave has value v_0 and its angular velocity is ω. Which of the following equations will correctly represent the complete wave at x_0 agreeing with above wave forms ?



(i) (y-t) graph



(ii) (v-t) graph

(A) $y = -a\left[\cos\left\{\frac{2\pi}{T}(t-t_0)-\frac{\pi}{2}\right\}\right]$

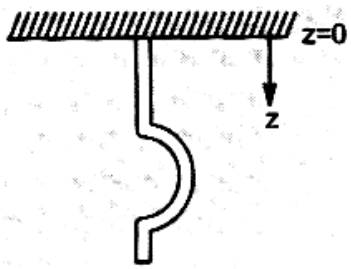
(B) $y = -a\left[\sin\left\{\frac{2\pi}{T}(t-t_0)+\frac{\pi}{2}\right\}\right]$

(C) $y = a\left[\sin\left\{\frac{2\pi}{T}(t-t_0)+\frac{\pi}{2}\right\}\right]$

(D) $y = a\left[\cos\left\{\frac{2\pi}{T}(t-t_0)-\frac{\pi}{2}\right\}\right]$

Space for rough work

7. A rope hangs from a rigid support. A pulse is set by jiggling the bottom end. We want to design a rope in which velocity v of pulse is independed of z, the distance of the pulse from fixed end of the rope. If the rope is very long the desired function for mass per unit length $\mu(z)$ in the terms of μ_0 (mass per unit length of the rope at the top) (z=0), g,v and z is



(A) $\mu(z) = \mu_0 e^{-\left[g/v^2\right]z}$ (B) $\mu(z) = \mu_0 e^{+\left[g/v^2\right]z}$

(C) $\mu(z) = \mu_0 \log_e\left(\frac{g}{v^2}\right)z$ (D) $\mu(z) = \mu_0 e + \left(\frac{v^2}{g}\right)z$

SECTION 2 (Maximum Marks: 15)

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will get +4 marks; darkening only (A) and (D) will get +2 marks; and darkening (A) and (B) will get –2 marks, as a wrong option is also darkened.

8. The (x,y) coordinates of the corners of a square plate are (0,0) , (L,0) , (0,L) and (L,L). The edges of the plate are clamped and transverse standing waves are set – up in it .If u (x,y) denotes the displacement of the plate at the point (x,y) at some instant of time, the possible expression(s) for u is (are): (a= positive constant).

(A) $a\cos(\pi x/2L)\cos(\pi y/2L)$ (B) $a\sin(\pi x/L)\sin(\pi y/L)$

(C) $a\sin(\pi x/L)\sin(2\pi y/L)$ (D) $a\cos(2\pi x/L)\sin(\pi y/L)$

9. A transverse sinusoidal wave of amplitude a, wavelength λ and frequency f is traveling on a stretched string. The maximum speed of any point on the string is v / 10, where v is the speed of propagation of the wave. If $a = 10^{-3}$ m and v = 10 m/s, then λ and f are given by:

(A) $\lambda = 2\pi \times 10^{-2}$m (B) $\lambda = 10^{-3}$m

(C) $f = \frac{10^3}{2\pi}$Hz (D) $f = 10^4$Hz

Space for rough work

10. A standing wave of time period T is set up in a string clamped between two rigid supports. At t =0 antinode is at its maximum displacement 2A.
(A) The energy of a node is equal to energy of an antinode for the first time at t =T / 8
(B) The energy of node and antinode becomes equal after every T /2 second
(C) The displacement of the particle of antinode at $t = \frac{T}{8}$ is $\sqrt{2}A$
(D) The displacement of the particle of node is zero

11. The equation of a wave traveling on a string is given by $y = 8 \sin\left[(5m^{-1})x - \left(4x^{-1}\right)t\right]$. Then
(A) velocity of wave is 0.8 m/s
(B) the displacement of a particle of the string at t =0 and x = $\frac{\pi}{30}$m from the mean position is 4 m
(C) the displacement of a particle from the mean position at t =0, x = $\frac{x}{30}$m is 8 m
(D) velocity of the wave is 0.4 m/s

12. Standing waves are produced on a stretched string of length L with fixed ends. When there is a node at a distance L /3 from one end, then
(A) minimum and next higher number of nodes excluding the ends are 2,5 respectively
(B) minimum and next higher number of nodes excluding the ends are 2,4 respectively
(C) frequency produced may be $v/(3L)$
(D) frequency produced may be 3v / (2L) (v = velocity of waves in the string)

13. Two pluses traveling on the same string are described by $y_1 = \frac{5}{(3x-4t)^2+2}$ and $y_2 = \frac{-5}{(3x+4t-6)^2+2}$
marks the **correct** statement(s).
(A) The direction in which each pulse is traveling : y_1 is in positive x –axis, y_2 is in negative x –axis
(B) The time when the two waves cancel every where is 0.75 sec
(C) The point where the two waves always cancel is x = 1 m
(D) Amplitude is different for two waves

14. In a standing wave on a string rigidly fixed at both ends
(A) All the particles must be at their positive extremes simultaneously once in half of the time period
(B) All the particles must be at their positive extremes simultaneously once in a time period
(C) In one time period all the particles are simultaneously at rest twice
(D) All the particles are never at rest simultaneously

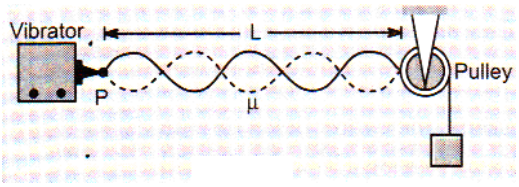
Space for rough work

SECTION 3 (Maximum Marks: 18)

- This section contains **TWO** paragraphs.
- Based on each paragraph, there are **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.

Paragraph–1

In the arrangement shown in fig a mass can be hung from a string (with a linear mass density of μ = 0.00200 kg / m) that pass over a light pulley. The string is connected to a vibrator (of constant frequency f), and the length of the string between point P and the pulley is L = 2.00 m. When the mass m is either 16.0 kg or 25.0 kg, standing waves are observed; however, no standing waves are observed with any mass between these values.



15. What is the frequency of the vibrator ?
(A) 400 Hz (B) 300 Hz (C) 350 Hz (D) None of these

16. What is the largest mass for which standing waves could be observed ?
(A) 400 kg (B) 200 kg (C) 800 kg (D) 1200 kg

Paragraph–2

A string of mass m is fixed at both ends. The fundamental frequency of excitation is ν and maximum displacement amplitude is A. Answer the following Questions

17. The maximum possible Kinetic Energy of the string is
(A) $\pi^2 mA^2\nu^2$ (B) $\frac{\pi^2 mA^2\nu^2}{2}$ (C) $2\pi^2 mA^2\nu^2$ (D) None of these

18. The mean kinetic energy of the string averaged over one oscillation period is
(A) $\pi^2 mA^2\nu^2$ (B) $\frac{\pi^2 mA^2\nu^2}{4}$ (C) $\pi^2 mA^2\nu^2$ (D) $\frac{\pi^2 mA^2\nu^2}{2}$

Space for rough work

PART II: CHEMISTRY

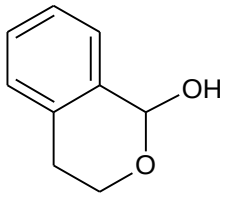
SECTION 1 (Maximum Marks: 28)

∗ This section contains **SEVEN** questions.
∗ Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
∗ For each question, darken the bubble corresponding to all the correct option in the ORS.

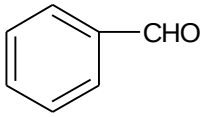
19. Analyse the given information

	2,4-DNP	Fehling's Solution	Iodoform Test	Tollen's Test
A.	Turns red	Negative	Positive	Positive
B.	Turns red	Positive	Positive	Positive
C.	Turns red	Negative	Negative	Positive

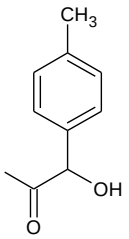
And consider the following molecules



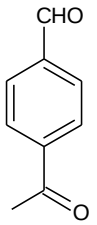
(I)



(II)



(III)



(IV)

Choose the correct match
(A) A-IV,B-III,C-I (B) A-IV,B-III,C-II (C) A-III,B-IV,C-II (D) A-III,B-IV,C-I

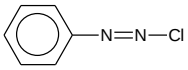
20. The IUPAC name of the wilkinsons catalyst ($RhCl(PPh_3)$) is
(A) Chlorido tris (triphenyl phosphine) rhodium(I)
(B) Chlorido tris (triphenyl phosphine) rhodium(IV)
(C) Chlorido tris (triphenyl phosphine) rhodium(0)
(D) Chlorido tris (triphenyl phosphine) rhodium(VI)

21. Which of the following pairs cannot be distinguished by using fehling's solution
(A) CH_3COOH, HCHO (B) C_6H_5CHO, HCHO
(C) CH_3CHO, HCHO (D) All

22. The compound(s) that exhibit(s) geometrical isomerism is(are)
(A) $\left[Pt(NH_3)(py)Cl_2\right]$ (B) $[Pt(py)_4]^{2+}$
(C) $\left[PtCl_4\right]^{2-}$ (D) All

Space for rough work

23. Compound 'A' (molecular formula C_3H_8O) is treated with acidified potassium dichromate to form a product 'B' (molecular formula C_3H_6O). 'B' forms a shining silver mirror on warming with ammoniacal silver nitrate. 'B' when treated with an aqueous solution of $NH_2CONHNH_2$.HCl and sodium acetate gives a product 'C'. Identify the structure of 'C'.
(A) $CH_3CH_2CH{=}NNHCONH_2$ (B) $CH_3{-}C(CH_3){=}NNHCONH_2$
(C) $CH_3{-}C(CH_3){=}NCONHNH_2$ (D) $CH_3CH_2CH{=}NCONHNH_2$

24. Which of the following compounds will give positive Lassaigne's test for nitrogen.
(A) NH_2OH (B) NH_2NH_2 (C) KCN (D) 

25. In which of the following the chemical formula and the name are incorrectly matched
(A) $K\left[Pt(NH_3)Cl_5\right]$-Potassium Ammine pentachloro palatinate (IV)
(B) $\left[Ag(CN)_2\right]^-$ – dicyanoargentate (I) ion
(C) $K_3\left[Cr(C_2O_4)_3\right]$ – Potassium trioxalato chromate (III)
(D) $Na_2\left[Ni(EDTA)\right]$ – sodium ethylene diammine tetra–aceto nickel (II)

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26. In which of the following, the oxidation state of metal ion is zero
(A) $Ni(CO)_4$ (B) $Fe_2(CO)_9$ (C) $Na[Co(CO)_4]$ (D) Cu_2Cl_2

27. Which of the following statements are correct about $[Fe(H_2O)_5NO]\ SO_4$
(A) It is paramagnetic complex (B) Oxidation state of Fe is + 1
(C) Charge on NO is + 1 (D) Coordination number of Fe is 5.

28. Atomic numbers of Cr and Fe are respectively 25 and 26. Which of the following is diamagneticmagnetic with the spin of the electron
(A) $\left[Cr(CO)_6\right]$ (B) $\left[Fe(CO)_5\right]$ (C) $\left[Fe(CN)_6\right]^{4-}$ (D) $\left[Cr(NH_3)_6\right]^{3+}$

Space for rough work

29. A metal complex having composition $[Cr(NH_3)_4Br_2I]$ was isolated in two forms (X) and (Y). Form (X) reacts with $AgNO_3$ to give a pale yellow precipitate which is partially soluble in excess of NH_4OH whereas Y gives a greenish yellow precipitate which is insoluble in NH_4OH.
which of the following statements are incorrect regarding X and Y are
(A) X – cis form optically inactive; Y – cis form optically active
(B) X – cis form optically inactive; Y – trans form optically active
(C) The cis & trans form of both X and Y are optically active
(D) The cis & trans form of both X and Y are optically inactive

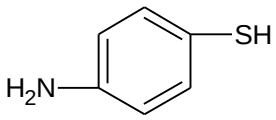
30. $X \xrightarrow{HI} I \xrightarrow{AgNO_2} II \xrightarrow{HNO_3} III \xrightarrow{NaOH} W$
Choose the correct combinations of 'X' and 'W'

	'x'	'w' (colour of final product)
(A)	$CH_3-CH=CH-OH$	Blue
(B)	$Ph-\underset{\underset{CH_3}{\vert}}{CH}-OH$	White
(C)	$Ph-\underset{\underset{CH_3}{\vert}}{CH}-CH\ OH\ CH_3$	White
(D)	$CH_3-\underset{\underset{OH}{\vert}}{CH}-CH=CH_2$	Red

31. For which of the following organic compound, the Lassaigne's extract on treatment with $FeSO_4; H_2SO_4$ give blood red colour

CH_2-SH
$|$
CH_2-SH

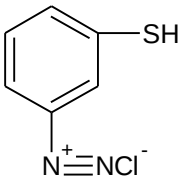
(A)



(B)

$CH_3-N=C=S$

(C)



(D)

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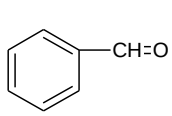
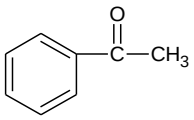
32. Consider the following molecules:



(I)



(II)

Molecules I and II can be distinguished by

(A) 2,4-DNP (B) I_2, OH^- (C) Fehling's solution (D) Tollen's reagent

SECTION 3 (Maximum Marks: 18)

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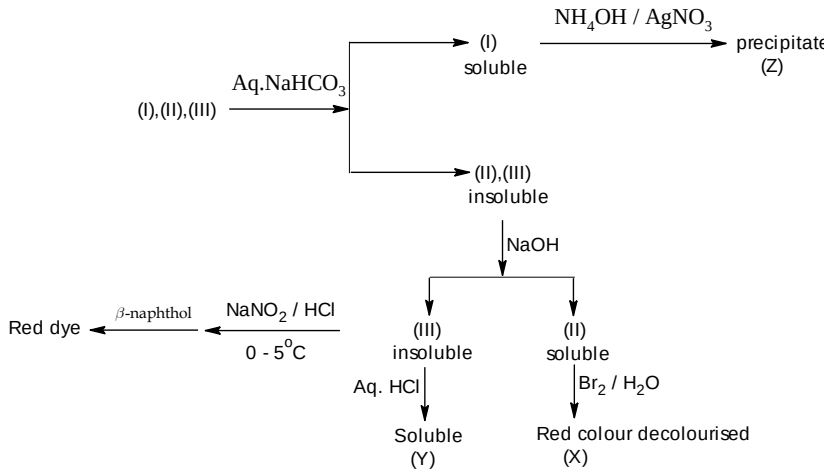
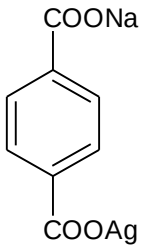
Paragraph–1

The components of organic mixture can be separated by simple chemical method. Aromatic carboxylic acids are soluble in sodium bicarbonate solution while the phenols are soluble in NaOH solution. Organic bases (aromatic amines) are soluble in aqueous HCl solution. The separated components are identified by laboratory tests of functional groups. Observe the analysis of following organic mixture composed of three components (I, II, III)

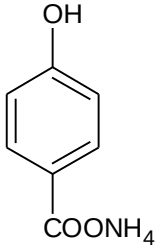


Space for rough work

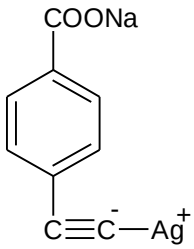
33. The compound Z can be



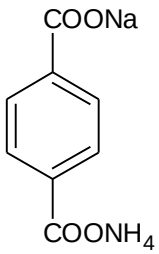
(A)



(B)

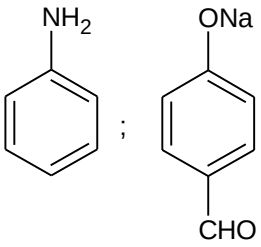


(C)

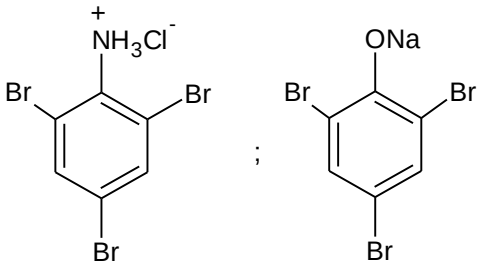


(D)

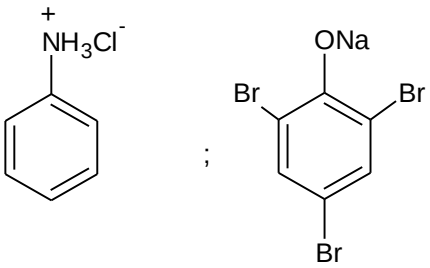
34. The compound X and Y can be



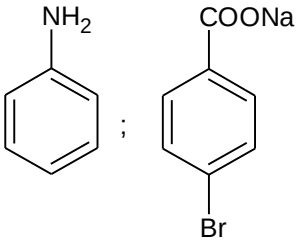
(A)



(B)



(C)



(D)

Space for rough work

Paragraph–2

The coordination number of Ni^{+2} is 4

$NiCl_2 + KCN(\text{excess}) \rightarrow A(\text{cyano complex})$

$NiCl_2 + \text{conc.}HCl(\text{excess}) \rightarrow B(\text{chloro complex})$

Based on this passage answer the following:

35. Predict the magnetic nature of A and B
(A) Both are diamagnetic
(B) A is diamagnetic and B is paramagnetic with one unpaired electron
(C) A is diamagnetic and B is paramagnetic with two unpaired electrons
(D) Both are paramagnetic

36. The hybridization of A and B are
(A) dsp^2, sp^3 (B) sp^3, sp^3 (C) dsp^2, dsp^2 (D) sp^3d^2, sp^3

PART III: MATHEMATICS

SECTION 1 (Maximum Marks: 28)

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to all the correct option in the ORS.

37. Solution of $\left(xe^{\frac{y}{x}} - y\sin\frac{y}{x}\right)dx + x\sin\frac{y}{x}dy = 0$

(A) $\log x = c + \frac{1}{2}e^{\frac{-y}{x}}\left(\sin\frac{y}{x} + \cos\frac{y}{x}\right)$ (B) $\log x = c + \frac{1}{2}e^{\frac{y}{x}}\left(\sin\frac{y}{x} - \cos\frac{y}{x}\right)$

(C) $\log x = c + \frac{1}{2}e^{\frac{y}{x}}\left(\sin\frac{y}{x} + \cos\frac{y}{x}\right)$ (D) $\log x = c + \frac{1}{2}e^{\frac{-y}{x}}\left(\sin\frac{y}{x} - \cos\frac{y}{x}\right)$

Space for rough work

38. The solution of $p^2 + (2y\cot x)p = y^2$ where $p = \frac{dy}{dx}$ is

(A) $y(1+\cos x) = c$ (B) $y(1-\cos x) = c$

(C) $x = 2\sin^{-1}\sqrt{c/2y}$ (D) $x = 2\sin^{-1}\left(\sqrt{2y}\right) + C$

39. The order and degree of the D.E. $\sqrt{\frac{d^2y}{dx^2}} = 3\sqrt{\frac{dy}{dx}} + 3$ are respectively

(A) 2, 3 (B) 2, 2 (C) 2, 6 (D) none of these

40. The solution of $y(xdy - ydx)\cos\frac{y}{x} + (xdy + ydx)x\sin\frac{y}{x} = 0$ Satisfying $y(1) = \frac{\pi}{2}$ is

(A) $y\cos\left(\frac{y}{x}\right) = \frac{\pi}{2}$ (B) $x\cos\left(\frac{y}{x}\right) = \frac{\pi}{2y}$

(C) $y\sin\left(\frac{y}{x}\right) = \frac{\pi}{2x}$ (D) $x\sin\left(\frac{y}{x}\right) = \frac{\pi}{2x}$

41. The solution of the differential equation $(1+y^2)dx + \left(x - e^{-\tan^{-1}y}\right)dy = 0$ and passing through origin is

(A) $xe^{\tan^{-1}y} = \cot^{-1}y$ (B) $xe^{\cot^{-1}y} = \tan^{-1}y$

(C) $ye^{\tan^{-1}x} = \tan^{-1}x$ (D) $xe^{\tan^{-1}y} = \tan^{-1}y$

42. The solution of the differential equation

$\sqrt{y^2 - x^2y^2 + x^3y^2 - x^5y^2}\,dy = \sqrt{x^4y^2 - x^6 + 2x^4y - x^6y^2 - 2x^6y + x^4}\,dx$ is

(A) $y - \log(y+1) = \frac{2}{3}\sqrt{1+x^3} + c$ (B) $x - \log(x+1) = \frac{2}{3}\sqrt{1+y^3} + c$

(C) $y + \log(y+1) = \frac{2}{3}\sqrt{1+x^3} + c$ (D) $x + \log(x+1) = \frac{2}{3}\sqrt{1+y^3} + c$

Space for rough work

43. If $\frac{5z_2}{7z_1}$ is purely imaginary, then $\left|\frac{2z_1+3z_2}{2z_1-3z_2}\right|$ =

(A) $\frac{2}{3}$ (B) 1 (C) 0 (D) 2

SECTION 2 (Maximum Marks: 15)

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will get +4 marks; darkening only (A) and (D) will get +2 marks; and darkening (A) and (B) will get –2 marks, as a wrong option is also darkened.

44. Which of the following statements is false

(A) The differential equation representing the family of curves $y = 2C(x+\sqrt{c})$ where C is a positive parameter is of degree one

(B) If $x = \sin\theta; y = \sin K\theta$ where K is a constant and θ is a parameter then $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + K^2y = 0$

(C) The solution of differential equation $x\cos\frac{y}{x}(y\,dx + x\,dy) = y\sin\frac{y}{x}(x\,dy - y\,dx)$ is $xy = K\cdot\cos\frac{y}{x}$

(D) The solution of $\frac{dy}{dx} = \frac{-(2x+3y+1)}{(3x-y+5)}$ is given by $2x^2 + 6xy - y^2 + 2x - 10y + K = 0$

45. The differential equation representing the family of curves $y^2 = 2c\left(x+\sqrt{c}\right)$ where c is a positive parameter, is of

(A) order 1 (B) order 2 (C) degree 3 (D) degree 4

46. The solution of differential equation $\frac{dy}{dx} = \frac{y}{x} + \tan\left(\frac{y}{x}\right)$.

(A) $\sin(y/x) = cx$ (B) $y = x\sin^{-1}(cx)$ (C) $2ye^x = e^{2x} + c$ (D) y = xc

Space for rough work

47. Parabolas each of which has a Latus rectum 4a, and whose axes are parallel to X- axis is

(A) $xy\frac{d^2y}{dx^2}+x\left(\frac{dy}{dx}\right)^2-y\frac{dy}{dx}=0$ (B) $y^2=x^2+2xy\frac{dy}{dx}$

(C) $y\left(\frac{dy}{dx}\right)^2+2x\frac{dy}{dx}-y=0$ (D) $2a\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^3=0$

48. For the differential equation $y=x\frac{dy}{dx}-2\left(\frac{dy}{dx}\right)^2$ which of the following is/are solutions?

(A) $y=c(2c-x)$ (B) $y=c(x-2c)$ (C) $y^2=8x$ (D) $x^2=8y$

49. If z_1 and z_2 are two complex numbers such that $|z_1+z_2|^2=|z_1|^2+|z_2|^2$ then

(A) $\frac{z_1}{z_2}$ is purely real (B) $\frac{z_1}{z_2}$ is purely imaginary

(C) $z_1\bar{z}_2+\bar{z}_1z_2=0$ (D) $\arg\left(\frac{z_1}{z_2}\right)=0$

50. Suppose three real numbers a, b, c are in G.P let $z=\frac{a+ib}{c-ib}$ then

(A) $Z=\frac{ib}{c}$ (B) $Z=\frac{ia}{b}$ (C) $Z=\frac{ia}{c}$ (D) z = 0

Space for rough work

SECTION 3 (Maximum Marks: 18)

- This section contains **TWO** paragraphs.
- Based on each paragraph, there are **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.

Paragraph–1

By using proper substitution homogeneous differential equation is converted into variable separable type

a) If the equation is of the form $\frac{dy}{dx} = f\left(\frac{y}{x}\right)$ we substitute y = u x

b) If the equation is of the form $\frac{dx}{dy} = f\left(\frac{y}{x}\right)$ we substitute x = y u

c) If the equation is of the form x f(xy) dx + y g(xy) dy = 0 then we substitute xy = u

51. The solution of differential equation $(x^2 + y^2)dx - 2xy\,dx = 0$ is
(A) $x^2 - y^2 = xc$ (B) $x^2 - y^2 = yc$ (C) $x^2 - y^2 = c$ (D) $x^2 + y^2 = yc$

52. The solution of $(x\,dy + y\,dx)\sin(xy) + \left(x^2ydy + y^2xdx\right)\cos(xy) = 0$
(A) xy sin(xy) = c (B) xy cos (xy) = c (C) xy tan (xy) = c (D) xy cot(xy) = c

Space for rough work

Paragraph–2

For a complex number z, $|z|^2 = z\bar{z}$ when z = $\bar{z}$, it implies that 'z' is purely real. When z = $-\bar{z}$, it implies that 'z' is purely imaginary. For the argument, Arg $\left(\frac{z_1}{z_2}\right) = Arg(z_1) - Arg(z_2)$, $Arg(z_1 z_2) = Arg(z_1) + Arg(z_2)$ also $|\sin\theta| \le |\theta|$.

53. Let $z_1 = 4+6i$ and $z_2 = 10+6i$. If z is any complex number such that Arg $\left(\frac{z-z_2}{z-z_1}\right) = \frac{\pi}{4}$, then $|z-7-9i|$ =

(A) $2\sqrt{2}$ (B) $4\sqrt{2}$ (C) $\sqrt{2}$ (D) $3\sqrt{2}$

54. If $z_1 = \frac{\left(\sqrt{3}-i\right)^2\left(1+\sqrt{3}i\right)}{1-i}$, $z_2 = \frac{\left(1-\sqrt{3}i\right)^2\left(\sqrt{3}+i\right)}{1+i}$ then $3(Ampz_1) + Ampz_2$ is

(A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{3\pi}{4}$ (D) $\frac{\pi}{2}$

Space for rough work

FIITJEE RET – 9

(2017 – 2019)(2ND YEAR_CHAMPIONS)

IIT-2017 (P2)

DATE: 10.09.2018

ANSWERS

PHYSICS

1.	**C**	2.	**D**	3.	**C**	4.	**B**
5.	**A**	6.	**C**	7.	**A**	8.	**B,C**
9.	**A,C**	10.	**A,C,D**	11.	**A,B**	12.	**A,D**
13.	**A,B,C**	14.	**C**	15.	**C**	16.	**A**
17.	**A**	18.	**D**				

CHEMISTRY

19.	**B**	20.	**A**	21.	**C**	22.	**A**
23.	**A**	24.	**C**	25.	**D or A**	26.	**A, B**
27.	**A, B, C**	28.	**A, B, C**	29.	**A, B, C**	30.	**Bonus**
31.	**B, C**	32.	**B, D**	33.	**C**	34.	**C**
35	**C**	36	**A**				

MATHEMATICS

37.	**A**	38.	**A ,B,C**	39.	**A**	40.	**C**
41.	**D**	42.	**A**	43.	**B**	44.	**ACD**
45.	**AC**	46.	**AB**	47.	**D**	48.	**BD**
49.	**BC**	50.	**AB**	51.	**Bonus**	52.	**Bonus**
53.	**D**	54.	**A**				