BLUE PRINT FOR MODEL QUESTION PAPER – 3

Class : II PUC **Subject : PHYSICS (33)**

Unit	Chapter Number	CHAPTERS	Number of teaching Hours	Weightage of marks	1Mark	2 Marks	3 Marks	5 Marks (Theory)	5 Marks (Numerical Problem)
I	1	Electric Charges And Fields	9	8	• •	•		•	
II	2	Electrostatic Potential And Capacitance	9	8			•		•
III	3	Current Electricity	15	13			•	•	•
IV	4	Moving Charges And Magnetism	10	8	•	•		•	
V	5	Magnetism And Matter	8	6	•	•	•		
	6	Electromagnetic Induction	7	6	•	•	•		
VI	7	Alternating Current	8	8			•		•
	8	Electromagnetic Waves	2	2	• •				
VII	9	Ray optics and optical instrument	9	8	•	•		•	
VIII	10	Wave Optics	9	8	•	•			•
IX	11	Dual Nature Of Radiation And Matter	6	5				•	
	12	Atoms	5	5					•
X	13	Nuclei	7	6	•	•	•		
	14	Semiconductor Electronics	12	11	•	•	•	•	
	15	Communication System	4	3			•		
		Total Number of Questions	--	--	10	8	8	6	5
		TOTAL MARKS	120	105	20	16	24	30	25

MODEL QUESTION PAPER – 3
II P.U.C. PHYSICS (33)

Time: 3 hours 15 min. **Max. Marks: 70**

General instructions:

a) All parts are compulsory.

b) Answers without relevant diagram/ figure/circuit wherever necessary will not carry any marks.

c) Direct answers to the Numerical problems without detailed solutions will not carry any marks.

PART – A

I Answer the following **10 x 1 = 10**

1. What is electric dipole.
2. State Ampers circuital law.
3. Mention any one use of electromagnet.
4. Name the law which gives polarity of induced emf.
5. Give the wavelength range of X-rays.
6. Mention the expression for displacement current.
7. How does the power of a lens vary with its focal length?
8. Who proposed wave theory of light?
9. Write the SI unit of activity.
10. Draw the circuit symbol of npn transistor.

PART – B

II. Answer any FIVE of the following questions **5×2 = 10**

11. Write any two properties of electric field lines.
12. Mention an expression for force on charge moving in uniform magnetic field and explain the terms.
13. Define the terms retentivity and coercivity.
14. What are eddy currents? Give one use of eddy currents.
15. What is a thin prism? Write its deviation expression.
16. Represent the plane polarised light and unpolarised light diagrammatically.
17. Define half-life of radioactive element and mention expression for it.
18. Write two differences between intrinsic and extrinsic semiconductors.

PART – C

III. Answer any FIVE of the following Question **5×3 = 15**

19. Derive an expression for an electric potential energy of a system of two point charges in the absence of electric field.
20. State and explain Ohm's law and hence define ohm.

21. Write any three properties of ferromagnetic materials.
22. Derive an expression for motional emf ,induced across the end of a conducting rod moving in a uniform perpendicular magnetic field
23. Mention any three sources of energy losses in transformer.
24. Mention three properties of nuclear forces .
25. Distinguish between conductors,insulators and semiconductors on the basis of band theory
26. Draw the block diagram of amplitude modulation transmitter.

PART – D

IV. Answer any TWO of the following Questions 2×5 = 10

27. Obtain an expression for electric field due to an infinitely long straight uniformly charged wire using Gauss law
28. Derive an expression of effective resistance of two resistors connected in parallel
29. Derive an expression for magnetic field on the axis of circular wire carrying electric current.

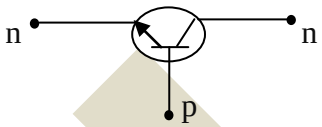
V. Answer any TWO of the following Questions 2×5 = 10

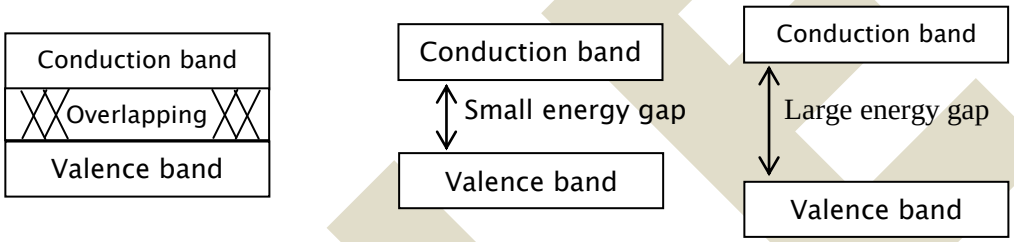
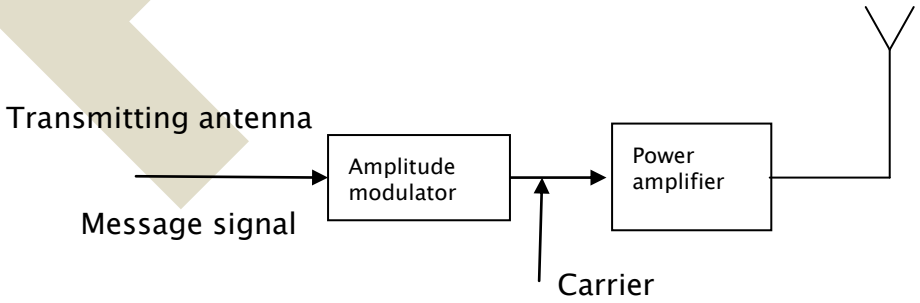
30. Derive the expression for the refractive index of the material of the prism in terms of angle of prism A and angle of minimum deviation D
31. What is photoelectric effect? Using Einstein's photoelectric equation, explain three experimental results.
32. Explain n-p-n transistor as an amplifier in common emitter mode.

VI. Answer any THREE of the following. 3×5 = 15

33. A 400 pF capacitor charged by a 100 V d c supply is disconnected from the supply and connected to another uncharged 400pF capacitor calculate the loss of energy.
34. Three resistors 1Ω,2Ω and 3Ω are connected in series, what is the total resistor of the combination? if the combination is connected to a battery of emf 12 V and negligible internal resistance then obtain the potential drop across each resistor.
35. A series L C R circuit with R = 20Ω,L =1.5 H and C = 35μF is connected to a variable frequency of 200 V AC supply when the frequency of the supply is equal to the natural frequency of the circuit , what is the average power transferred to the circuit in one complete cycle.
36. Monochromatic light of wavelength 5000 A^{o} from a narrow slit is incident on the double slit. If the separation of 10 fringes on the screen 1 m away is 2 cms . Find the slit separation.
37. Calculate the shortest and longest wavelength of Balmer series of hydrogen atom. Given R = 1.097 x10 ^{7}/m.

SCHEME OF EVALUATION: MODEL QUESTION PAPER – 3

Q. No	ANSWERS	Marks
I.	**PART – A**	
1.	Two equal and opposite charges separated by small distance constitutes an electric dipole.	1
2.	The line integral of magnetic field around any closed path in free space is equal to μ_o times the net current enclosed by that path .	1
3.	Used in electric cells/loud speakers/telephone (ANY ONE)	1
4.	Lenz's law	1
5.	$0.1A^o$ to $100A^o$	1
6.	Displacement current: $i_d = \varepsilon_o \frac{d\varphi_E}{dt}$	1
7.	Inversely	1
8.	Huygen	1
9.	Bequerel or dis/s	1
10.		1
II.	**PART–B**	
11.	Any two	
12.	$F = B\,q\,v \sin\theta$ Explanation of terms	1 1
13.	Correct Definitions	1each
14.	Meaning Any one use	1 1
15.	It is a prism of small angle $d = A(n-1)$	1 1
16.	Representation(diagram) Polarized Un-polarised	 1 1
17.	Definition Expression	1 1
18.	Two differences	1 each
III	**PART–C**	
19.	$V_1 = \frac{1}{4\pi\varepsilon_o}\frac{q_1}{r}$ $W = \frac{1}{4\pi\varepsilon_o}\frac{q_1}{r} \cdot q_2$ This work done is stored in the charges as potential energy and is given by , $PE = \frac{1}{4\pi\varepsilon_o}\frac{q_1 q_2}{r}$ Where r is the distance between the charges	1 1 1
20.	Statement. Explanation. Definition of ohm .	1 1 1

21.	Any three properties	1 each
22.	Magnetic flux enclosed by the loop is given by = ϕ = B l x From Faraday's law , <u>magnitude</u> of induced emf is given by, $e = \frac{d\varphi}{dt}$ ------>(2) Arriving at $e = B\,l\,v$ $\quad \because \frac{dx}{dt} = v$	1 1 1
23.	Any three losses	1 each
24.	Any three properties	1 each
25.	 Conductors Semiconductors Insulators **or** <u>Conductors.</u> In conductors,valence band and conduction bands are overlapped . <u>Semiconductors</u> semiconductors, the valence band and conduction bands are separated by small energy gap . <u>Insulators.</u> In insulators, the valence band and conduction bands are separated by large energy gap	1each 1each
26.		3
	PART–D	
IV.		
27.	Figure Flux through curved surface = E area of curved surface = E • 2 • r l -….(1)	1 1

	From Gauss's theorem, Flux = $\frac{q}{\varepsilon_o}$ ---->(2)	1
	On comparing (1)and (3), we get	
	$E \cdot 2 \cdot r\, l = \frac{\lambda\, l}{\varepsilon_o}$	1
	$E = \frac{1}{2\ \pi\ \varepsilon_o}\frac{\lambda}{r}$	1
28.	Figure	1
	$I = I_1 + I_2$	1
	$I_1 = \frac{V}{R_1}$ and $I_2 = \frac{V}{R_2}$	1
	$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2}$	1
	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$	1
29.	Diagram	1
	dB = $dB = \frac{\mu_o}{4\pi}\frac{I(\vec{dl}\times\vec{r})}{r^3}$	1
	$dB = \frac{\mu_o}{4\pi}\frac{Idl}{r^2}$	1
	Magnetic field due to two elements = 2dB sinϘ	1
	Arriving at $dB = \frac{\mu_o}{4\pi}\frac{2\pi IR^2}{(R^2+x^2)^{3/2}}$	1
V.		
30.	Ray diagram	1
	$n = \frac{\sin i_1}{\sin r_1}$	1
	Arriving at d = (r_1+r_2-A)	1
	Graph or expatiation of variation of d with i (angle of incidence)	1
	Arriving at final expression , $n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$	1

31.	Meaning of photoelectric effect Equation Three results	1 1 1each
32.	Circuit diagarm Input and out wave forms Explanation	1 1 3
VI.		
33.	$U_i = \frac{1}{2}CV^2 = \frac{1}{2}qV = 2\times10^{-6}J$ After connecting charged capacitor to uncharged capacitor of same capacity $\frac{1}{2}$ of the charge will flows $\therefore U_f = \frac{1}{2}q^1V = \frac{1}{2}\left(\frac{q}{2}\right)V = \frac{qV}{4} = 1\times10^{-6}J$ Loss in energy, $U_i - U_f = 1\times10^{-6}J$	1 1 2 1
34.	$R_s = R_1 + R_2 + R_3$ $R_s = 1+2+3 = 6\Omega$ $I = \frac{E}{R+r}$ $I = \frac{12}{6} = 2A$ pd across R_1, $V_1 = IR_1 = 2V$ pd across R_2, $V_2 = IR_2 = 4V$ pd across R_3, $V_3 = IR_3 = 6V$	1 1 1 1 1
35.	$Z = \sqrt{R^2 + (X_L - X_C)^2}$ At resonance $X_L - X_C = 0$ $\therefore Z = R$ $I = \frac{V}{Z} = 10A$ $P = VI = 2000W$	1 1 1 1 1

36.	$n\beta = 1\times10^{-2}$ $\therefore \beta = \frac{10^{-2}}{n} = \frac{10^{-2}}{10} = 10^{-3} m$ $\beta = \frac{\lambda D}{d}$ $==> d = \frac{\lambda D}{\beta} = 2.5\times10^{-4} m$	1 1 1 2
37.	$\frac{1}{\lambda} = R\left[\frac{1}{n_1^{\,2}} - \frac{1}{n_2^{\,2}}\right]$ To calculate longest wavelength $n_1 = 2$ *and* $n_2 = 3$ $\frac{1}{\lambda} = 1.097\ x10^{\,7}\left[\frac{1}{2^2} - \frac{1}{\infty}\right]$ $\frac{1}{\lambda} = R\left[\frac{1}{n_1^{\,2}} - \frac{1}{n_2^{\,2}}\right]$ $\lambda = 6.5616x10^{-7} m$ To calculate shortest wavelength, $n_1 = 2$ *and* $n_2 = \infty$ $\frac{1}{\lambda} = 1.097\ x10^{\,7}\left[\frac{1}{2^2} - \frac{1}{\infty}\right]$ $\lambda = 3.647x10^{-7} m$	1 1 1 1 1