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SB-3438

M. Sc (Part - I) Examination

March / April – 2011

Physics : Paper - II

(Quantum Mechanics & General Electronics)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M. Sc. (PART - 1)**

Name of the Subject :

☛ **PHYSICS : PAPER - 2**

☛ Subject Code No. : **3 4 3 8** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Use separate answer book for each section.
(3) Symbols used have their usual meaning.
(4) Figures to the **right** indicate full marks.

SECTION - I

1 (a) Explain Clebsh Gordan coefficients ? **3**

(b) Write down the limitations of the Klein Gordan equation. **3**

(c) Briefly discuss the admissibility condition on the wave function. **3**

(d) Find $\left[x, P^n\right]$ **2**

2 (a) What do you mean by Normalize and Non-normalize wave function. Discuss probability interpretation and box normalization procedure in detail. **7**

(b) Prove that $(x,p)^2 = x^2p^2 - L^2 + i\hbar(x,p)$. **5**

OR

2 (a) Deduce and discuss the necessary equations for degenerate perturbation theory. 7

(b) For Pauli's matrices prove that $\sigma_x\sigma_y = -\sigma_y\sigma_x = -i\sigma_z$ and $\sigma_+\sigma_- = 2(1+\sigma_z)$ 5

3 (a) Derive Fermi Golden Rule for transition probability per unit time for one transition to the other transition states. 7

(b) Estimate the scattering amplitude and scattering cross section for screen coulomb potentile using Born Approximation. 5

OR

3 (a) Using abstract operator method show that the energy eigenvalue of harmonic oscillator is $\left(n+\frac{1}{2}\right)\hbar w_c, n = 0,1,2,....$ 7

(b) Prove that linear moment P_x is self adjoint operator. 5

SECTION - II

4 (a) List different types of networks. 2

(b) Briefly explain drawbacks of fixed biasing circuit. 3

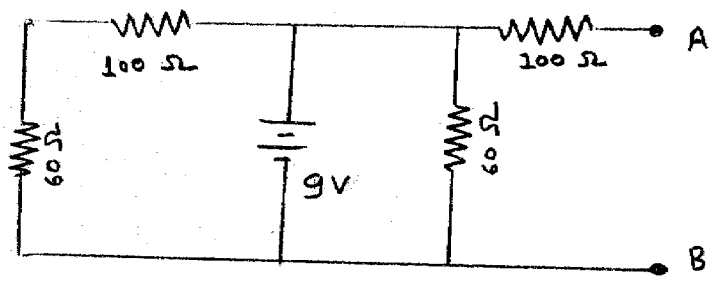
(c) Using truth table, Show that 3

$$\overline{A\cdot B} + A\cdot B = \overline{\left(A\cdot\overline{B} + \overline{A}\cdot B\right)}$$

(d) What is the difference between a comparator and an operational amplifier ? Draw the transfer characteristics of a comparator. 3

5 (a) Giving example, explain Thevenion's theorem. 7

(b) Compute R_{Th} and V_{Th} between point A and B in the following circuit. 5



OR

5 (a) What is the difference between an active and a passive filter ? Draw the circuit diagram of an operational amplifier based first order band pass active filter. Draw and explain its frequency response. **7**

(b) Using operational amplifier design a circuit that finds the average of its three inputs V_a V_b and V_c. **5**

6 (a) Draw the internal block diagram of an IC-555 and explain its operation as an astable multivibrator. **7**

(b) Using comparator, design a circuit that generate square wave of 1.5kHz frequency. **5**

OR

6 (a) What is counter ? With waveform and truth table explain working of a three bit ripple counter. **7**

(b) Using Boolean relations simplify and implement following, **5**

(i) $Y = \left(\overline{A + (A \cdot B) \cdot C}\right)$

(ii) $Y = (A + B) \cdot (A + C)$