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P.G. (Semester-III) Examination, 2020
PHYSICS

[Paper : MPHYCC-10]

Time : Three Hours]   [Maximum Marks : 70

Note : Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks. Answer **any five** questions, in which Question **No. 1** and **2** are **compulaory.**

GROUP-A

1. Choose the correct answer of the following questions.

    [2x10=20]
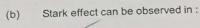
    (a) Singlet and triplet state can be observed by :

    (i) One electron

    (ii) Two electrons

    (iii) Three electrons

    (iv) None of the above

30062/390   (1)   [P.T.O.]

(b) Stark effect can be observed in :

(i) Electric field

(ii) Magnetic field

(iii) Both (i) and (ii)

(iv) None of these

(c) In Zeeman effect of alkali spectra we observed two lines D_1 and D_2, which line is more intense ?

(i) D_1

(ii) D_2

(iii) Both (i) and (ii)

(iv) None of these

(d) Population inversion can be achieved, when :

(i) $N_1 > N_2$

(ii) $N_1 < N_2$

(iii) $N_1 = N_2$

(iv) None of these

(e) Multiplicity is defined as :

(i) $r = 2s + 1$

(ii) $r = 2s - 1$

(iii) $r = 2s$

(iv) None of these

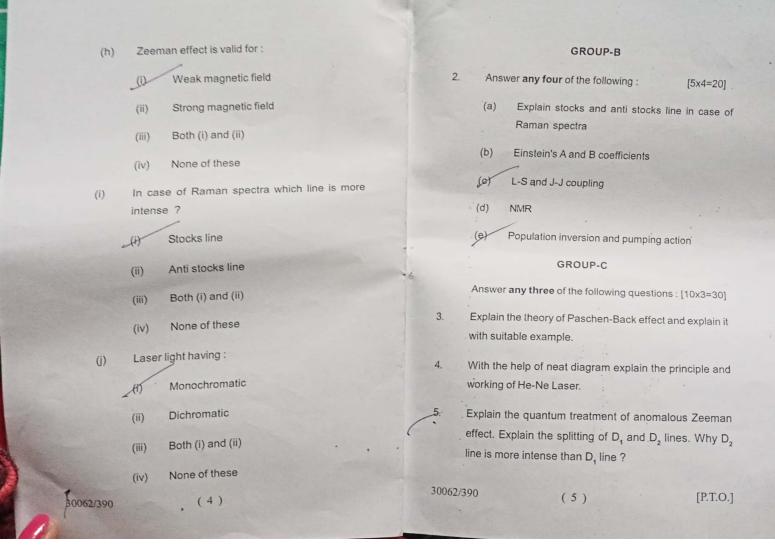(f) In Electron Spin Resonance (ESR) the atoms and molecules with .... spins of electron.

(i) Paired

(ii) Unpaired

(iii) Both (i) and (ii)

(iv) None of these

(g) Wave number is the reciprocal of wavelength in :

(i) Vaccum

(ii) Medium

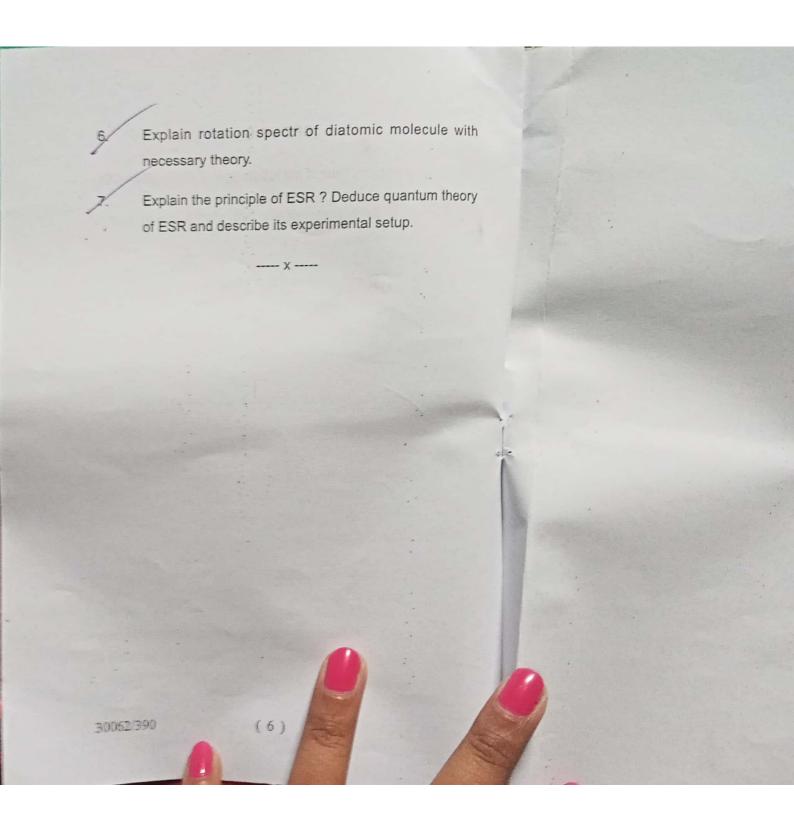(iii) Both (i) and (ii)

(iv) None of these

(h) Zeeman effect is valid for :

  (i) Weak magnetic field

  (ii) Strong magnetic field

  (iii) Both (i) and (ii)

  (iv) None of these

(i) In case of Raman spectra which line is more intense ?

  (i) Stocks line

  (ii) Anti stocks line

  (iii) Both (i) and (ii)

  (iv) None of these

(j) Laser light having :

  (i) Monochromatic

  (ii) Dichromatic

  (iii) Both (i) and (ii)

  (iv) None of these

GROUP-B

2. Answer **any four** of the following : [5x4=20]

  (a) Explain stocks and anti stocks line in case of Raman spectra

  (b) Einstein's A and B coefficients

  (c) L-S and J-J coupling

  (d) NMR

  (e) Population inversion and pumping action

GROUP-C

Answer **any three** of the following questions : [10x3=30]

3. Explain the theory of Paschen-Back effect and explain it with suitable example.

4. With the help of neat diagram explain the principle and working of He-Ne Laser.

5. Explain the quantum treatment of anomalous Zeeman effect. Explain the splitting of D_1 and D_2 lines. Why D_2 line is more intense than D_1 line ?

6. Explain rotation spectr of diatomic molecule with necessary theory.

7. Explain the principle of ESR ? Deduce quantum theory of ESR and describe its experimental setup.

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P.G. (Semester-III) Examination, 2020

PHYSICS

[Paper : MPHYCC-12]

Time : Three Hours]   [Maximum Marks : 70

Note : Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks. Answer from all the groups as directed.
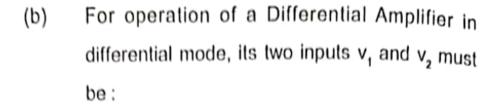
GROUP-A

1.   Choose the correct answer of the following questions.

[2x10=20]

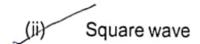(a)   The general configuration of an Op-Amp consists of :

(i)   Two stages

(ii)   Three stages

(iii)   Four stages

(iv)   Five stages.

30064/390   (1)   [P.T.O.]

(b) For operation of a Differential Amplifier in differential mode, its two inputs v_1 and v_2 must be :

(i) $v_1 = v_2$

(ii) $v_1 \neq v_2$

(iii) $v_1 = -v_2$

(iv) $v_1 = 2v_2$

(c) The output of a Schmitt's Trigger is a :

(i) Sinosoidal wave

(ii) Square wave

(iii) Triangular wave

(iv) None of the above

(d) In a comparator circuit, Two voltages applied at the two inputs of the operational Amplifier are equal when its output voltage is :

(i) Positive

(ii) Negative

      (iii)   Zero

      (iv)   Infinite

(e)   A precision Rectifier is used to rectify a.c. voltages of :

      (i)   All ranges

      (ii)   Small range

      (iii)   High ranges

      (iv)   None of these

(f)   Which of the following is not a member of a Bipolar Logic Family ?

      (i)   R.T.L.

      (ii)   D.T.L.

      (iii)   CMOS

      (iv)   T.T.L.

(g)   Active Filters are designed with :

      (i)   Op-Amp, Resistance and Inductance

      (ii)   Op-Amp, Resistance and Capacitance

(iii)   Op-Amp, Inductance and Capacitance

(iv)   Resistance, Inductance and Capacitance

(h)   A multiplexer consists of :

    (i)   One input and many outputs

    (ii)   Many inputs and many outputs

    (iii)   Many inputs and one output

    (iv)   Many inputs and no output

(i)   A T-type flip flop is produced from a M.S.J.K. Flip-Flop by connecting its :

    (i)   J and K inputs

    (ii)   J-input to K-input through an inverter

    (iii)   J-input with the clock

    (iv)   K-input with the clock

(j)   A n-bit shift Register requires :

    (i)   n - S.R. Flip Flops

    (ii) $(n + 1)$ - S.R. Flip Flops

(iii)   n - M.S.J.K. Flip Flops

(iv)   (n + 1) - M.S.J.K. Flip Flops

GROUP-B

2.   Describe in short, **any four** of the following : [5x4=20]

(a)   Comparator

(b)   T.T.L

(c)   D - Type Flip Flop

(d)   Decoder

(e)   Schmitt Trigger

GROUP-C

Note : Answer **any three** of the following questions : [10x3=30]

3.   What is Differential Amplifier ? Draw its circuit diagram
      and analyse it to obtain the expression for its common
      mode gain and Differential mode gain.

4.   What is Active Filter ? Explain different types of active
      filters with their second order transfer functions. How a
      second order High pass active filter is realized ?

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5. What is Transistor - Transistor Logic (TTL) ? Explain the operation of a TTL Nand gate. What is Schottky TTL ?

6. What is Multiplexer ? give its block diagram and explain its working. How two 16 : 1 Multiplexer can be used to produce a 32 : 1 multiplexer ?

7. Explain the circuit diagram and working of a Master Slave J.K. Flip Flop.

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P.G. (Semester-III) Examination, 2020

PHYSICS

[Paper : MPHYCC-13]

Time : Three Hours]   [Maximum Marks : 70

Note : Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks. Answer **any five** questions, in which Question **No. 1** and **2** are **compulaory.**

GROUP-A

1.   Choose the correct answer of the following questions.

[2x10=20]

(a)   Nuclear forces are :

    (i)   Charge independent

    (ii)   Repulsive in nature

    (iii)   Long range forces

    (iv)   Weaker than Coulomb force

30065/390   (1)   [P.T.O.]

(b)   Which of the following is an Exchange Force ?

   (i)   Yukawa Force

   (ii)   Serber Force

   ✓(iii)   Heisenberg Force

   (iv)   Coulomb Force

(c)   Which of the following statements is true for a compound nucleus ?

   (i)   The compound nucleus is stable

   ✓(ii)   The decay mode of compound nucleus is independent of its formation mode

   (iii)   The decay mode of compound nucleus depends on its formation mode

   (iv)   None of these

(d)   The Magic numbers are :

   ✓(i)   2, 8, 20, 28, 50, 82, 126

   (ii)   2, 8, 10, 18, 20, 50, 84, 156

   (iii)   2, 8, 18, 32, 50, 72, 98

   (iv)   2, 8, 18, 28, 84, 125

(e)   The collective model of nucleus was given by :

    (i)   N. Bohr

    (ii)   A. Bohr

    (iii)   C. Bohr

    (iv)   None of these

(f)   Even-even nuclei have total ground state angular momentum :

    (i)   One

    (ii)   Zero

    (iii)   Very large

    (iv)   None of these

(g)   The theory of β-decay predicted the concept of :

    (i)   Mesons

    (ii)   Positrons

    (iii)   Neutrino

    (iv)   None of these

(h)   Electromagnetic interaction is responsible for :

    (i)   Decay Process

    (ii)   Atomic Binding

    (iii)   Nuclear Binding

    (iv)   Atomic and Nuclear Binding

(i)   The Hyperons $\pi^0, \Sigma^+, \Sigma^-, \Sigma^0$ have masses :

    (i)   Greater than nucleon

    (ii)   Less than nucleon

    (iii)   Equal to nucleon

    (iv)   Zero

(j)   The decay modes of $K^{\pm}$

    (i) $K^{\pm} \rightarrow \pi^{\pm} + \pi^0$

    (ii) $K^{\pm} \rightarrow n + \pi^0$

    (iii) $K^{\pm} \rightarrow n + \pi^+$

    (iv) $K^{\pm} \rightarrow p + \pi^-$

GROUP-B

2.   Discuss, in brief, **any four** of the following : [5x4=20]

   (a)   Exchange Forces

   (b)   Types of Nuclear Reactions

   (c)   Collective Model

   (d)   Internal Conversion

   (e)   C.P.T. invariance

GROUP-C

Note : Answer **any three** of the following questions : [10x3=30]

3.   Explain low energy n - p scattering. Obtain expression for its scattering cross section.

4.   Explain shell model of nucleus and give its experimental evidence. Discuss the success and failure of this model.

5.   Obtain Breit-Wigner one-level formula for compound nucleus.

6.   Explain Fermi theory of Beta decay.

7. What are the different types of interactions that takes place between elementary particles ?

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