# 2018

## M.Sc. 4th Semester Examination

## PHYSICS

**PAPER—PHS-404**

**Subject Code—33**

*Full Marks* : 40

*Time* : 2 Hours

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

***(Solid State Special)***

Answer Q. No. *1* and any *three* from the rest.

**1.** Answer any *five* bits : 5×2

(i) Find the effective number of Bohr Magneton of $Mn^{3+}$ having $3d^4$ electronic configuration.

(ii) What is the physical origin of a ferromagnetic domain and hence explain what is meant by domain rotation ?

(iii) Show in presence of magnetic field nature of transition from superconducting state to normal state.

(iv) Explain the origin of pauli's spin paramagnetism.

(v) Find the energy levels of nucleus of spin $I = \frac{3}{2}$ in a static magnetic field and find also the resonance condition.

(vi) Show the schematic spin arrangement in ferrous ferrite, $Fe_3O_4$ and find the net moment per unit cell.

(vii) Plot inverse susceptibility $\left(\frac{1}{\chi}\right)$ vs. T curve for a paramagnet, ferromagnet, antiferromagnet and a diamagnet.

2. Explain the origin of spin wave in a Ferromagnetic solid. Find the dispersion relation for a spin wave excited on the chain. What is Magnon ? 2+7+1

3. What is Bloch wall ? Find the total energy per unit area of the Bloch wall. Explain why exchange integral is positive for iron group atoms. 2+6+2

4. Find an expression of effective number of Bohr magneton for a paramagnetic solid assuming narrow multiplets. Find an expression of magnetisation in a ferromagnetic substance on the basis of Wiss Molecular field. 6+4

5. Explain what is meant by cohevence length and hence find an expression. Clearly distinguish Type I and Type II superconductions on the basis of coherence length. 2+5+3

6. Describe in details the principle of ESR. How the presence of F-center is detected using ESR ? Explain flux quantigation in a superconductor and find an expression of fluxoid. 3+1+6

7. Explain what is meant by "isotope effect". What is a cooper pair in a superconductor ? Explain briefly the BCS theory to explain origin of superconductivity. 2+3+5

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***(Applied Electrnics Special)***

*Use separate Answer-scripts for Group-A & Group-B*

**Group-A**

[ Marks : 20 ]

Answer Q. No. *1* and any *one* from the rest.

1. Attempt any *five* of the following : 2×5

   (a) What is the frame reception rate used in Indian TV system and why it is not set at 24 as in motion pictures ?

   (b) Explain the terms — Even field and Odd field.

   (c) Draw the block diagram of a staircode ramp type digital voltmeter.

   (d) Find the length of the dipole required to receive channel VI.

(e) What do you mean by Vestigial Side Band (VSB) modulation and why it is used in TV picture signal modulation ?

(f) Why automatic gain control (AGC) circuits are used in TV receiver ?

(g) Draw the waveform of composite video signal between two consecutive horizontal sync pulses.

2. (a) Explain in details the operation of vidicon TV camera with a neat diagram. 5

(b) Explain the meaning of positive and negative modulation with proper diagrams. Which modulation is preferred in TV picture signal modulation and why ? (1+1)+2

(c) Write the value of picture IF and sound IF frequencies in CCIR-system B type transmission. 1

3. (a) Explain the terms : Saturation, Hue and Luminance. 3

(b) Draw the block diagram of a colour TV camera showing generation of colour signals and luminance signal. 2

(c) Why colour difference signals are transmitted, instead of transmitting the individual colour signals ? Which colour difference signals are transmitted and why ? 2+1+2

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## Group-B

[ Marks : 20 ]

Answer Q. No. *1* and any *one* from the rest.

**1.** Answer any *five* questions : 5×2

(a) Explain address and data multiplexing in 8086 microprocessor.

(b) What are the basic differences between 8085 and 8086 $\mu$p ?

(c) What will be the content of A register after the execution of the following program ?

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MVI  A  BC
     XRI  B2
     DCR  A
     HLT
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(d) Differentiate PWM and PPM.

(e) Give the schematic of delta modulation transimission section.

(f) What is BPSK ?

(g) Design a circuit using 1 : 8 De-MUX to solve following digital equation :

$$Y = \overline{A}BC + A\overline{B}C + AB\overline{C} .$$

(h) In a TDM-PAM system if 20 voice signals have to be transmitted in 8-bit sampling method with 8 KHz sampling frequency then what will be the bit rate in that transmission line ? Consider one "sync." bit for every frame.

2. (a) Explain FSK modulation system with proper block diagram. Show that FSK is the addition of two OOK.

(b) Give the phasor diagram of Q.P.S.K.

(c) A signal $m(t) = 4 \sin 4000\pi t + 6 \sin 10000\pi t$ has to be recovered from its samples. What is the minimum sampling rate

(i) according to low pass sampling theorem.

(ii) according to band pass sampling theorem.

4+2+4

3. (a) Write a program for 8085 $\mu$p to find out the SUM of fifteen numbers given in 3050 memory location onwards.

(b) Explain how the physical address for instruction is generated in 8086 $\mu$p.

(c) What is opcode ? Give example of single byte, double byte and triple byte instruction. 4+3+3

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