2019

PG

4th Semester Examination

PHYSICS

Paper - PHS 404

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.

SOLID STATE SPECIAL

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

1. Answer any *two* bits : 5×2

(i) Explain what is meant by quenching of orbital angular momentum in a magnetic solid ?

(ii) Find the spectroscopic notation and effective number of Bhor Magneton for C_e^{3+} having $4f^1\,5s^2\,5p^6$ configuration ?

[Turn Over]

(iii) Prove that superconducting state is more ordered state than normal state ?

(iv) Explain with a neat diagram the formation of Block Wall in a ferromagnetic solid.

(v) Explain the principle of ESR and how it can detect the presence of F center ?

(vi) Explain the current-voltage characteristics when an insulator is placed between metal and a superconductor.

(vii) Give an example of a Ferrite. Why Ferrite are technically important ?

2. Explain Pauli's spin paramagnetism in a solid and find an expression of susceptiblity in such solid at T = OK. 3+7

3. (a) Find the energy levels of nucleus of spin $I = \frac{3}{2}$ in a static magnetic field and also find the resonance condition ? 4+6

(b) Deirve Bloch equations to explain in relation to the above phenomenon.

4. Explain by Molecular field theory the origin of antiferromagnetism in solid and hence find an expression of Neel temperature. Show the variation

of susceptilulity of an antiferromagnetic single crystal with temperature. 2+7+1

5. Derive the exchange interaction expression for ferromagnetic solid on the basic of Heitler London theory. 10

6. What is meant by flux quantization and derive expression of fluxoid in this respect. What is origin of negative surface energy and what type of superconductor does it lead to ? 7+3

7. (a) Considering a linear chain of atoms, find the dispersion relation for a spin wave excited on the chain. 6+3+1

   (b) Derive Bloch's $T^{3/2}$ law.

   (c) What is Magnon ?

ELECTRONICS SPECIAL

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

1. Attempt any *five* of the followings : 2×5=10

   (a) Why TEM mode of propagation is not possible in a waveguide ?

[Turn Over]

(b) What do you mean by pre-emphasis and de-emphasis ? Why they are done ?

(c) What is the normal channel width alloted for transmission of both picture and sound signals in Indian TV system ? What is the maximum frequency deviation used for frequency modulated sound transmission ?

(d) What are aspect ratio and active line frequency of CCIR-B TV standard ?

(e) What type of modulation is used in TV transmission for audio signal & Video signal in Indian TV system ?

(f) Write down full forms of PAL and SECAM.

(g) Explain how colour difference signals disappear at the output of the signal combining matrix on white and grey shades.

2. (a) Show that for transverse electric waves propagating through a perfectly conducting cylindrical waveguide, the waveguide behaves like a high pass filter and derive the expression for the cut-off frequency of the waveguide. 5

(b) "Phase velocity of an em wave is much greater than free space velocity of light" - Explain.

(c) What are the merits of digital voltmeter over analog voltmeter ? 2+3

3. (a) Draw the detailed block diagram of a B/W TV receiver and explain the operation of its different blocks for reception and reproduction of picture and sound signals. 5

(b) What do you mean by interlaced scanning and why it is used in TV transmission system ? Distinguish between even and odd fields. What are the values of the field frequency and frame frequency used in Indian TV transmission system? 2+2+1

DIGITAL ELECTRONICS

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

1. Answer any *five* of the followings : 5×2=10

(a) A signal $m(t) = 2 \text{ Cos } 9000\,\pi t + 4 \text{ Cos } 4000\,\pi t$ is to be reconstructed from its samples. What is the minimum sampling rate from band pass consideration ?

(b) What are the merits of PCM ?

[Turn Over]

(c) What is the role of anti-aliasing filter in PCM transmission unit ?

(d) What are the uses of ALE and $Io/\bar{M}$ signals of 8085μp ?

(e) What will be the output of 'A' register after the execution of the following program ?

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MVI  A  FO
DCR  A
ANI     FO
HLT
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(f) Give the schematic of ASK demodulation technique.

(g) In an 8086 μP all the segment registers contain the hex data FFOO. If the content of IP is 0020 then what will be physical address of an instruction?

(h) In a digital communication if the quantum level is changed from 5 bit system to 8 bit system then what will be the change in signal to noise ratio ?

2. (a) Write a program in 8085 μP to operate the following function $Y = 2B + 3C - 1F$. Indicate the

memory locations required to store the program from 5000 onwards.

(b) Give an account of execution unit (EU) and bus interface unit (BIU) of 8086 μP. What are the registers used in these units?

(c) What are the interrupt pins of 8085 μP? What are their priorities ?

3. (a) Explain with proper block diagram the mudulation technique of Q.P.S.K.

(b) Differential pulse code modulation is advantageous over P.C.M. justify.

(c) What do you mean by flat top sampling and natural sampling. 5+3+2
