M.Sc.

2009

4th Semester Examination

PHYSICS

PAPER—PH-2204

Full Marks : 40

Time : 2 Hours

The figures in the right-hand 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

(*Marks : 40*)

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

1. Answer any *five* bits : 5×2

(a) Find an expression for coherence length in a superconductor.

(b) Show that the superconductor – Normal phase transition is first order in presence of a field and find its Latent heat.

(c) Find the expression for maximum current density in a superconductor in terms of energy gap parameter.

(d) Find the effective number of Bohr magneton for Mn^{2+} having $3d^5$ electronic configuration.

(e) Explain the concept of Magnon.

(f) What do you mean by ferrite. Outline its importance.

(g) What is the physical origin of a domain.

(h) Explain the difference between a perfect conductor and a superconductor. Show that the thermodynamic state of the superconductor depends on the parameters B & T, while that of a perfect conductor depends on the process.

2. (a) Derive the conditions under which electrophorus-electron interaction becomes attractive. 8

(b) Explain the formation of energy gap at the fermi energy in a superconductor. 2

3. (a) Drive an expression for current in DC. Josephson tunnelling. $2\frac{1}{2}$

(b) Explain the concept of flusoid and fluxion in a superconductor ring. $2\frac{1}{2}$

(c) Explain the variation of maximum current in QSQUID. 5

4. Find an expression for exchange energy assuming interaction of two normal hydrogen like atoms according to Heitler london scheme and hence explain the origin of ferromagnetism in a solid. 10

5. (a) Applying molecular field theory, find an expression for susceptibility in an antiferromagnetic solid. Find an expression for Neel temperature. 7

(b) Explain nuclear magnetic resonance & hence find usual resonance condition. 3

6. (a) Describe in details the quantum theory of paramagnetism. 8

(b) What is meant by quenching of orbital angular momentum. 2

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APPLIED ELECTRONICS

Analog Electronics—2204A

(*Marks : 20*)

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

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

(a) Draw the timing details of a vertical blanking pulse with proper namings of different portions.

(b) Mention the nature of modulations of both audio and video (picture) signal in TV transmission.

(c) Differentiate between even field and odd field in case of TV transmission.

(d) Find the length of the dipole of an Yagi-Uda antenna used for receiving channel 5 (Band III).

(e) Explain the method of linear interlaced scanning used in a TV system.

(f) Find the frequencies of picture carrier and sound carrier for channel 4 (Band I).

(g) Write two advantages of a digital voltmeter over analog voltmeters ?

(h) Draw the voltage-current characteristic curve of a SCR at different gate currents.

2. (a) Describe the construction details and operation of monochrome TV picture tube. 5

(b) What do you mean by vestigial side band transmission ? Show the details frequency distribution of a channel used in CCIR–B system of TV transmission and mark the location of picture and sound carrier frequencies. Does it need any correction somewhere in the television link ? If so how it is made ? 1+2+2

3. (a) Draw the cross sectional diagram of a Triac and its I–V characteristics with proper labelling of different voltages and currents. Explain how it can be used to control the intensity of a bulb in A.C. circuit with proper diagrams. 1+2+3

(b) Draw the block diagram of a digital voltmeter (DVM) and hence discuss the principle of operation of the digital voltmeter. 4

Digital Electronics—2204B

(Marks : 20)

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

1. Answer any *five* questions : 5×2

(i) What is aliasing effect and how to overcome it ?

(ii) What is the output of B register after the following program :

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MVI C AO H
MOV A, C
ANI 01 H
MOV B, A
HLT
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(iii) What are the different register in 8086 μp ?

(iv) Explain with proper example :
(a) Single byte instruction ;
(b) Multi-byte instruction.

(v) What are the merits and demerits of "Flat top sampling" ?

(vi) Using block diagram show how to get PCM signal from an analog signal.

(vii) Explain the quantization of an analog signal m(t).

(viii) State and explain sampling theorem.

2. (i) Write a program to subtract a 16 bit number stored at 2030(H) memory location from another 16-bit number stored at location 3030(H). Store the result at 4030 location. 5

(ii) Explain the conditional Jump statement.

(iii) Discuss how to attain 20 bit address bus in 8086 μp. 5+2+3

3. (i) In a T1 digital system 24 signals are multiplexed and are sampled at 8000 frames/sec. Considering one synchronization bit calculate the bit rate. Assume every signal is of 8 bit-signal.

(ii) What do you mean by Differential Pulse Code Modulation ?

(iii) "If the sampling pulse train has some finite width then the output signal is distorted." True or False ? Justify.

(iv) Why "Guard-band" is preferable in sampling theorem ? 3+2+3+2
