M.Sc.

2011

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.

(Marks : 40)

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

1. Answer any *five* bits : 2×5

(a) Prove that superconducting state is more ordered state than normal state in a superconductor.

(b) What is meant by quantum of flux in a superconducting ring?

(c) Write down the fundamental condition for electron spin resorance. How does it help to determine the defect in a solid?

(d) Find the spectroscopic notation and effective number of Bhormagneton for Cr^{2+} ion having $3d^4$ configuration.

(e) Describe in details the current voltage characteristics when an insulator is placed between metal and a superconductor.

(f) Show the schematic spin arrangement in ferrous ferrite and calculate the net magnetic moment per unit cell.

(g) Explain—What is the origin of energy gap in a supreconductor.

2. Describe in details Heitlev-London theory to explain the origin of ferromagnetism in a solid 10

3. Describe in details the electron-Phonon-electron interaction in a superconductor and prove that the interaction is attractive. 10

4. Describe in detail AC Josesphson effect and hence find an expression for tunneling current. Show how the characteristics is changed when electromagnetic wave is incident on a biased junction. 8+2

5. What is meant by coherence-length in a superconductor. Find an expression for coherence length. How do you classify type I and type II superconductor on this basis. Show the sechematic configuration of a SQUID. 2+4+2+2

6. (a) What is ferrimagnetism? Using molecular field theory, show that three antiferro-magnetic interactions can result in ferrimagnetism. 1+2

(b) Obtain the expressions of Curie temperature and susceptibility of ferrimagnet. 2+2

(c) Can you consider an antiferromagnet as a special case of ferrimagnet? Explain. 1+2

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APPLIED ELECTRONICS

Group—A

(Marks : 20)

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

1. Attempt any *five* bits : 2×5

(a) Explain the method of linear interlaced scanning used in a TV system and why it is needed ?

(b) Define the terms (i) Saturation and (ii) Hue.

(c) Draw the typical V/I characteristic cure of a diac.

(d) Draw the block diagram of vidicon type of TV camera.

(e) What are luminance signal and chrominance signal ?

(f) Why green colour difference signal i.e. (G – Y) signal is never used for colour signal transmission ?

(g) Why negative modulation is used in the case of TV picture signal modulation ?

(h) What are the roles of shadowmask and phosphor-dot trios in the colour TV.

2. (a) Explain how the 'y' signal and colour difference signals are developed from the colour video camera outputs. Draw the necessary block/circuit diagrams

(b) Describe with suitable diagrams the gun arrangements and construction details of a delta-gun colour picture tube. Why is it necessary to connect a very high voltage at the final anode of a colour picture tube? 6

3. (a) What is a Triac? With supporting block diagram discuss a construction of a Triac.

(b) What is a digital voltmeter? With supporting block diagram discuss the method of developing a $3\frac{1}{2}$ digit digital voltmeter. What is meant by a resolution by 1 bit? (2+2)+(1+4+1)

Group—B

(Marks : 20)

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

1. Answer any *five* questions : 5×2

(a) What is the difference between flat top sampling and natural sampling?

(b) If a 4 bit PCM system is changed into 8 bit system then what will be the change in signal to noise ratio and quantum state?

(c) What are the different flag register in 8086 μp ?

(d) What is the function of the following pin in 8085 μp ?

(i) SID, (ii) ALE, (iii) TRAP and (iv) HOLD

(e) Give the schematic block diagram of an offset QPSK transmitter.

(f) Explain the concept of differential phase shift keying.

(g) Give the output of A in the following program :

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MVI B OA
XRA A
ADD B
MOV C B
ANA C
HLT
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2. (a) What do you mean by time division multiplexing? Find out the bit rate per second in T1 digital system where 24 signals are to be multiplexed.

(b) Explain briefly the concept of differential pulse-code modulation.

(c) What are the different segment resister in 8086 μp? What is the role of this register?

(d) What are the advantages of 8086 μp over 8085μp?

3+3+3+1

3. (a) Name different digital modulation techniques. G the idea frequency shift keying.

(b) Write a program to add ten numbers stored ir memory location 3000 onwards. Store the result ir register.

(c) Two 16 bit number stored in 'X' & 'X+1' and 'Y' & 'Y locations. Add two numbers. Store the higher byte B and lower byte in C register.

3+4
