PG/IVS/PHS-404/13

M.Sc. 4th Semester Examination, 2013

PHYSICS

PAPER – PHS-404

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate 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

(*a*) Explain what is meant by 'Magnox' ?

(*b*) What is the physical origin of a domain in a ferromagnetic solid.

(*c*) Clearly explain how the current becomes steady in a superconductor and in a normal metal when d.c. field is applied.

(*d*) Explain what is the origin of energy gap in a superconductor.

(*e*) What is meant by persistence of current in a superconductor ?

(*f*) List the phenomena which favour the existence of energy gap in superconductor.

(*g*) What is the full form of SQUID and what is flux quantization ?

(*h*) In D.C. Josepshon effect 1 micro-volt is applied across the junction. How much frequency is generated ?

2. Describe in details the origin of ferromagnetism in solid and hence find an expression of Heisenberg's exchange Energy. 10

3. (*a*) Show that effective number of Bhor Magneton in case of narrow multiplets can be expressed as

$$p_{eff} = \sqrt{L(L+1)+4S(S+1)}$$

(*b*) What is meant by Domain wall ? 8 + 2

4. (*a*) Derive the expression for susceptibility of an antiferromagnetic solid for $T > T_N$.

(*b*) Write two technological applications of Ferrites. 8 + 2

5. (*a*) Find the condition under which electron-phonon-electron interaction is attractive.

(*b*) What do you mean by cooper pair; and explain the formation of cooper pairs. 7 + 3

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

7. (*a*) What is meant by coherence length ? Find an expression of it.

(*b*) What is superelectrons ?

(*c*) In what type of superconductor the surface energy is positive ? Explain the origin of positive surface energy in detail.
1 + 4 + 1 + 1 + 3

(*Electronics Special*)

GROUP – A

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

1. Attempt any *five* bits : 2 × 5

(*a*) What do you mean by interlaced scanning ? What are its advantages ?

(*b*) How horizontal and vertical blanking pulses are separated from the composite video signal ?

(*c*) Give the two transistor equivalent circuit of a SCR. Also draw the circuit symbol and I-V characteristics of a SCR.

(*d*) Show the details of the frequency distribution of channel 6 in CCIR system-B TV transmission system and mark the position of the picture carrier and sound carrier.

(*e*) Why green colour difference signal is not used for colour signal transmission ?

(*f*) Explain the advantages of negative modulation in case of TV signal transmission.

(*g*) Define the terms Saturation and Hue.

(*h*) What type of deflection is used in a TV picture tube and why this particular type of deflection is used in it ?

2. (*a*) Explain how the '*y*' signal and colour difference signals are developed from the colour video camera outputs. Draw the necessary block/circuit diagram. 4

(*b*) Draw the block diagram of a staircase ramp type digital voltmeter and explain its operation. 4

(*c*) Explain how a triac can be used in a light dimmer, drawing the necessary circuit diagram. 2

3. (*a*) Discuss about the development of vertical blanking and sync. pulses in CCIR system-B TV transmission standard. 6

(*b*) Sketch and fully label the desired response of a TV receiver that includes necessary correction on account of the discrepancy caused by VSB transmission. Comment on the response curve drawn by you. 4

GROUP – B

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

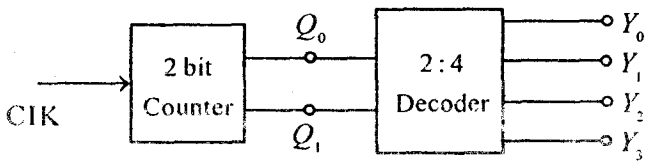
1. Answer any *five* bits : 2 × 5

(*a*) What do you mean by natural sampling and flat top sampling ?

(*b*) If a PCM system is changed from 4 bit to 6 bit then what will be the change in signal to noise ratio ?

(*c*) What is the difference between opcode and machine language ?

(*d*) Draw the output waveforms of the following circuit :



(*e*) Two hex numbers are X = 2B and Y = A3. What is the value of (*i*) X OR Y (*ii*) X AND Y.

(*f*) Write four basic differences between 8085 and 8086 microprocessor.

2. (*a*) What is quantization error in PAM ? Find out the expression of quantization error ?

(*b*) Give the basic idea of delta modulation.

(*c*) If the sampling pulse has some finite pulse width τ then there is a chance of distortion in the receiving signal. Justify. 4 + 3 + 3

3. (*a*) Describe the basic structure of BIU and EU in 8086 μP.

(*b*) Ten numbers are stored in memory location 3000 onwards. Write down a program to store the sum of that numbers in D register.

(*c*) Give the idea of A. L. U. in microprocessor. 4 + 4 + 2
