PG/IVS/PHS-404/14

M.Sc. 4th Semester Examination, 2014

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 Special*)

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

1. Answer any *five* bits : 2 × 5

(*a*) Explain what is meant by Magnon ?

(*b*) Show that in presence of magnetic field the superconducting to normal transition is First Order.

(*c*) Superconducting Tin has a critical temperature 3·7 K in zero magnetic field and a critical field of 0·0306 T at OK. Find the critical field at 2K.

(*d*) Find the spectroscopic notation for Fe^{3+} having $3d^5$ electron configuration.

(*e*) What is meant by coherence length ?

(*f*) Explain what is the physical origin of a magnetic domain.

(*g*) Explain negative surface energy corresponds to type II super conductor.

(*h*) In DC Josephson effect 1μV is applied across the junction. How much frequency is generated.

2. (*a*) Show that the effective number of Bhor magneton in case of wide multipletes of a paramagnetic material can be expressed as $p_{\text{eff.}} = g\sqrt{J(J+1)}$.

(*b*) What is meant by quenching of orbital angular momentum ? 10

3. (*a*) What is a Bloch wall ? Calculate the thickness of the domain wall.

   (*b*) Describe in details the molecular field theory of antiferromagnetism and hence find an expression of susceptibility. 5 + 5

4. (*a*) What is meant by flux quantization in a superconducting ring ? Derive an expression of fluxoid in this connection.

   (*b*) What do you mean by cooper pair ? Explain the formation of cooper pairs. 2 + 5 + 3

5. (*a*) What is magnetic resonance ? Explain nuclear magnetic resonance and hence find an expression of the resonance condition.

   (*b*) What is a Ferrite ? Write two technological application of Ferrite. 1 + 6 + 3

6. (*a*) Describe in details the Wein theory of Ferromagnetism. What is the main drawback of the theory ?

(*b*) What is Heisenberg's Exchange interaction ? 6 + 1 + 3

7. (*a*) What is Josephson tunneling ? Explain DC Josephson effect. Show that supercurrent of a superconducting pairs across the junction depends on the phase difference. Give some practical application of JOS tunnelling.

(*b*) What is SQUID ? 3 + 5 + 2

(*Electronics Special*)

GROUP – A

[*Marks* : 20]

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

1. Attempt any *five* bits : 2 × 5

(*a*) Define aspect ratio. What is its standard value in a TV scanning system ?

(*b*) How EHT is generated in a TV receiver ?

(*c*) Why triac is called a bidirectional thyristor ?

(*d*) What is the necessity of transmitting synchronising pulses along with the video signal in a TV system ?

(*e*) What do you mean by colour difference signal ? Which colour difference signals are transmitted in colour TV system ?

(*f*) Draw the frequency spectrum of channel 9 (CCIR - system B) and mark the positions of picture carrier and sound carrier.

(*g*) Enumerate essential requirements that must be met to make a colour TV system fully compatible with B/W TV system.

(*h*) Write two advantages of a digital voltmeter over analog voltmeter.

2. (*a*) With proper diagram discuss the construction and operation of a 'Vidicon' type TV camera. 5

(*b*) Explain why negative modulation is used in TV transmission system with proper diagrams of necessary waveforms. 3

(*c*) Explain the necessity of fabricating aquadag coatings in a TV picture tube. 2

3. (*a*) Draw the block diagram of a staircase ramp type digital voltmeter and explain the principle of operation. 5

(*b*) Draw the cross-sectional diagram of a silicon controlled Rectifier and its two transistor equivalent circuit. Also draw its I-V characteristics with proper labelling of different voltages and currents and explain analytically its I-V characteristics. 1 + 1 + 1 + 2

GROUP– B

[*Marks* : 20]

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

1. Answer any *five* bits : 2 × 5

(*a*) If a base band signal has frequency spectrum 5 kHz - 20 kHz and if it requires 5 kHz guard band then what should be the sampling frequency for the signal ?

(*b*) 'FSK' is the addition of two 'OOK' True or False ? Justify.

(*c*) Two hex numbers are X = FF and Y = 9B. What is the value in hex of (*i*) X OR Y (*ii*) X AND Y.

(*d*) Mention different conditional jump instructions for 8086 μp.

(*e*) If the value of code segment is FFFF and the value of instruction pointer is 2BOO then what should be the 'physical address' of the instruction in 8086 μp ?

(*f*) What do you mean by DPCM ?

(*g*) Give the complete block diagram of A.L.U.

2. (*a*) What do you mean by "aliasing effect" and "aparture effect" in PAM system ?

(*b*) Give the block diagram of PCM transmission sector.

(*c*) Give the idea of BPSK modulation technique.

(*d*) Explain the time division multiplexing of PAM system. 3 + 2+ 3 + 2

3. (*a*) Show schematically different register system in 8086 μp.

(*b*) Two numbers are stored in 'B' and 'C' register. Write a programme to add the numbers and store the result in H register if the result is in even parity and to store it in 'L' register if the result is in odd parity.

(*c*) What is the function of the following pin in 8085 μp :

(*i*) ALE

(*ii*) $\overline{\text{HLDA}}$.

(*d*) Write down the basic differences in 8085 and 8086 μp. 3 + 3+ 2 + 2