

2017**M.Sc. 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.**Illustrate the answers wherever necessary.***(Solid State Special)**

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

1. Answer any five questions : 2×5
- (a) Prove that superconducting state is more ordered state than normal state at $T < T_c$.
- (b) Explain what is meant by single particle tunneling ?
- (c) Prove that the Meissner effect is consistent with disappearance of resistivity in a superconductor.
- (d) Find the spectroscopic notation and effective number of Bohr magneton for Cr^{2+} having $3d^4$ electrons in the outermost orbit.

(Turn Over)

- (e) Show the schematic spin arrangement in Ferrous Ferrite. Why it is a technically important solid.
- (f) Show one application of NMR and one application of ESR.
- (g) What is Bloch $T^{3/2}$ law.
2. (a) Derive an expression of Exchange integral on the basis of Heitler London Scheme applied for a ferromagnetic solid.
- (b) Explain why Fe is Ferromagnet while Mn is non-ferromagnet. 8+2
3. (a) Express Molecular Field Theory approximation in case of Antiferromagnetism.
- (b) Find an expression of susceptibility of antiferromagnetic solid in the temperature range when the sublattices are far away from being magnetically saturate ?
- (c) Find an expression of Neel temperature. 2+5+3
4. (a) Explain the principle of NMR and hence find a frequency of precessional motion.
- (b) Explain what is meant by Spin-Lattice relaxation and hence find an expression of total rate of change of magnetisation ? 5+5

5. (a) Explain what is meant by coherence length.
(b) Find an expression of coherence length.
(c) Explain what is the origin of positive surface energy in a superconductor. 1+6+3
6. (a) Derive the condition under which electron-electron interaction in a superconductor becomes attractive.
(b) What is the origin of energy gap in a superconductor.
7. (a) Find the expression of effective number of Bohr magneton for a paramagnetic solid assuming wide multiplets.
(b) Find the expression of penetration of magnetic field due to different causes when AC field is applied to a superconductor. 5+5
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(Electronics Special : Analog)

Group-A

[Marks : 20]

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

1. Attempt any *five* questions : 2×5
- (a) Which mode of propagation is not possible in a waveguide and why ?

- (b) Write the advantages of digital voltmeter over analog one.
 - (c) Write the advantages of P/L colour picture tube over Delta gun colour picture tube.
 - (d) Why negative modulation is used in picture signal modulation ?
 - (e) Calculate the picture carrier and sound carrier frequency used for channel 7 in CCIR-system B type transmission.
 - (f) How horizontal and vertical sync pulses are separated from the composite video signal ?
 - (g) What do you mean by colour difference signal ? Which colour difference signals are transmitted in colour TV system ?
2. (a) Explain the construction details and operation of a P/L colour picture tube with necessary diagrams. 5
- (b) Explain the operation of a staircase ramp type digital voltmeter with necessary block diagram and state its advantages over simple ramp type digital voltmeter. 5
3. (a) Write a short note on the development of vertical blanking and sync pulses in CCIR system-B TV transmission standard. 5
- (b) Draw the block diagram of a B-W TV receiver and explain its operation. 5
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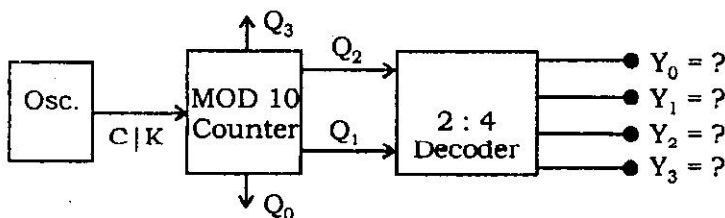
(Electronics Special : Digital)**Group-B**

[Marks : 20]

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

1. Answer any *five* questions : 5×2
- (a) Explain address and data multiplexing in 8076 μ P.
 - (b) A bandpass signal has a central frequency f_0 and extends from $f_0 + 5$ to $f_0 - 5$ kHz. The signal is sampled at a rate $f_s = 25$ kHz. As the central frequency f_0 varies from 5 to 50 kHz find the ranges of f_0 for which the sampling rate is adequate.
 - (c) What do you mean by PWM & PPM ?
 - (d) If a memory location starts with 0000 and ends with FFFF then how many locations are there ? If the word length is 8 then how many flip-flops are there in that memory cell ?
 - (e) State the basic difference between 8085 μ P and 8086 μ P.
 - (f) If a PCM system is changed from 4 bit to 8 bit then what will be the change in quantum state and signal to noise ratio ?
 - (g) What is comparator in digital communication technique ?

2. (a) What do you mean by "Bus Interface Unit" and "Execution Unit" of 8086 μ P? What is the advantage of having these two separate unit?
- (b) Write a program to move an array of 100 numbers from 3000 onwards to 4000 onwards memory location in 8085 μ P.
- (c) Draw the waveform of the following outputs :



3+4+3

3. (a) Give the block diagram of FSK receiver unit and show the generation of signal.
- (b) Derive the quantization error in PCM system. How it can be minimized?
- (c) Briefly state the differential pulse code modulation technique.

3+4+3