

**2022**

**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.*

**SPECIAL PAPER**

**PHS-404A      SOLID STATE PHYSICS**

[Marks : 40]

1. Answer any *four* questions : 4×2

(a) Prove that entropy in superconducting state is *lower than normal state.*

*(Turn Over)*

- (b) Find the Hund's ground state for  $Mn^{2+}$  having  $3d^5$  electron configuration.
- (c) Explain why pure ionic crystal does not show ESR but it shows for crystal containing F-Center.
- (d) 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.
- (e) Give an example of a Ferrite. Why ferrites are technically important solid.
- (f) What is meant by Quenching of orbital angular momentum ?

2. Answer any *four* questions :

4×4

- (a) What is a Bloch Wall? Calculate the thickness of the domain wall.
- (b) Explain NMR and find an expression of resonance condition.

- (c) Show that flux trapped in a superconducting ring exists in the form of flux quantum.
- (d) Find an expression of London Penetration Depth for a Superconductor.
- (e) What is the physical origin of a domain?
- (f) What is coherence length and find an expression of it?

3. Answer any *two* questions : 2×8

- (a) What is DC Josephson Tunnelling? Find an expression of maximum zero voltage current under this condition.
- (b) Derive expression of exchange integral assuming Heitler London approach for a ferromagnetic solid.
- (c) Explain Pauli's Spin Paramagnetism and hence find an expression of paramagnetic susceptibility at  $T = 0$  K.

- (d) What is Magnon ? Derive dispersion relation for Magnon.
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**SPECIAL PAPER**

**PHS-404B APPLIED ELECTRONICS**

**PHS-404B.1 APPLIED ANALOG ELECTRONICS-II**

[Marks : 20]

1. Answer any *two* questions : 2×2
- (a) Why automatic gain control (AGC) circuits are used in TV receiver ?
- (b) How horizontal and vertical synchronisation pulses are separated from the composite video signal ?
- (c) What do you mean by pre-emphasis and de-emphasis ? Why they are done ?
- (d) Why TEM mode of propagation is not possible in a wave guide ?

2. Answer any *two* questions :

2×4

- (a) Explain the construction details and operation of a precision-in-line (PIL) colour picture tube with necessary diagrams.
- (b) Explain the meaning of positive and negative modulation with proper diagrams. Which modulation is preferred in TV picture signal modulation and why?
- (c) Why colour difference signals are transmitted instead of transmitting individual colour signals in colour TV transmission system? Why green colour difference signal i.e. (G - Y) is never used for colour signal transmission?
- (d) (i) Write the advantages of digital voltmeter over analog one.
- (ii) Why interlaced scanning is used in TV system?

3. Answer any *one* question :

1×8

- (a) (i) Write a short note on the development of

vertical blanking and synchronisation pulses in CCIR system-B TV transmission standard.

- (ii) Draw the detailed block diagram of a black and white TV transmitter. 5+3
- (b) (i) Explain the detailed operation of a staircase ramp type digital voltmeter with necessary block diagram and state its advantages over simple ramp type digital voltmeter.
- (ii) Explain the terms 'Saturation', 'Hue' and 'Luminescence' in connection with colour TV transmission system. 5+3

#### **PHS-404B.2 APPLIED DIGITAL ELECTRONICS-II**

[Marks : 20]

4. Answer any *two* questions : 2×2

- (a) Differentiate ASK and FSK.
- (b) What is conditional jump statement in 8085  $\mu$ P? Give example.
- (c) In a TDM-PAM system 4 signals have to be transmitted with 8kHz sampling frequency and

8 bit word length. Find out the bit rate in that transmission line.

(d) What are the different FLAG registers in 8086  $\mu\text{P}$ ?

5. Answer any *two* questions : 2×4

- (a) Describe the modulation technique of QPSK.
- (b) Discuss with example the process of physical address generation of an instruction in 8086  $\mu\text{P}$ .
- (c) What is delta modulation? Mention the advantage and disadvantage of the process.
- (d) Write a program for 8085  $\mu\text{P}$  to add 10 numbers stored in memory location 5050 onwards.

6. Answer any *one* question : 1×8

- (a) (i) What is Pulse Width Modulation? Describe a simple process to generate PWM.

- (ii) Show that signal to noise ratio in PCM is increased by 6 dB for each bit. 4+4
- (b) (i) What are the difference of general purpose registers between 8085 and 8086  $\mu$ P?
- (ii) Explain the output of the following program :

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MVI C 05
MVI A 05
LINE 1 ADD A
DCR C
JNZL INE 1
HLT
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4+4

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