M.Sc. 2nd Semester Examination, 2023

PHYSICS

PAPER – PHS-203.1 & 203.2

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

PAPER – PHS 203.1

(*Analog Electronics-II*)

[*Marks* : 20]

1. Attempt any *two* of the following questions : 2×2

(*a*) Define internal poles and internal zeros of a network.

(*b*) Find the characteristic impedance of a π network with $Z_A = 8\ \Omega$, $Z_B = 12\ \Omega$, and $Z_C = 8\Omega$.

(*c*) Define primary line constants.

(*d*) Show that if a transmission line be terminated by its characteristic impedance, then there will be no reflection of the signal.

2. Attempt any *two* of the following questions : 4×2

(*a*) Define iterative impedance of a two port network. Find the expression of it for a T network.

(*b*) State and explain the two corollaries of Foster's reactance theorem.

(*c*) Explain the origin of distortions in a practical transmission line. How these can be removed ?

(*d*) Draw the cross sectional diagram and circuit symbol of a silicon controlled rectifier. Also draw its IV characteristics and indicate the names of different characteristic voltages and currents on it.

3. Attempt any *one* of the following questions : 8×1

(*a*) (*i*) Derive Telegraph's equations. Why they

are named so ? Solve them to derive the general expressions for voltage and current at any general point along the length of the transmission line.

(*ii*) Hence derive the expression for the input impedance of a transmission line 6 + 2

(*b*) Draw the circuit diagram of a constant K band stop filter and derive the expressions for its cut off frequencies. Derive the expressions for attenuation constant, phase constant and characteristic impedance in the pass band and attenuation bands. Also draw their variations as a function of frequency. 8

PAPER – PHS 203.2

(*Digital Electronics-II*)

[*Marks* : 20]

4. Answer any *two* questions : 2 × 2

(*a*) How many bit is there within the memory location F0 to FF in a 256 × 16 memory unit ?

(*b*) Give the difference between mnemonics and opcode.

(*c*) What are arithmetical and logical functions that can be executed by an ALU ?

(*d*) What do you mean by First-in-First-Out Memory ?

5. Answer any *two* questions : 4 × 2

(*a*) What do you mean by look ahead carry ? Explain the advantage of it.

(*b*) Define the term : SRAM and EPROM.

(*c*) Design a two-bit multiplier circuit.

(*d*) Give the output of 'A' register after executing the following program :

MVI A 2A / MVI B 3B / ORA B / HLT.

6. Answer any *one* question : 8 × 1

(*a*) (*i*) Design a circuit which can act both as an adder and as a subtracter and explain the operation.

(*ii*) If you have to choose one signal selectively out of 12 signals then how can you design the circuit with MUX IC(s). 4 + 4

(*b*) (*i*) Using decoder how can you expand the memory size from 16 × 8 to 64 × 8 ?

(*ii*) Explain, with proper diagram, the conversion method of an analog signal to digital signal. 4 + 4
