

**2017****M.Sc. 2nd Semester Examination****PHYSICS****PAPER—PHS-203***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.***Use separate Answer-scripts for Group-A & Group-B****Group—A**

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

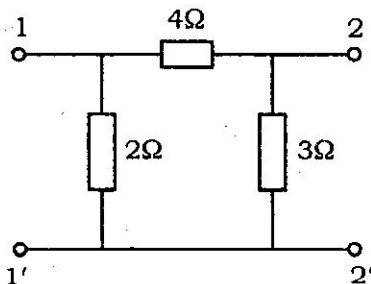
1. Answer any *five* questions : 2×5
- (a) Which material is used to fabricate a thermistor and why ?
  - (b) State Foster's reactance theorem.
  - (c) Define iterative impedance of a network and derive its expression for a T-network.
  - (d) What is frequency distortion and why it appears in a transmission line ?

*(Turn Over)*

- (e) Draw the circuit diagram of a constant-k band pass filter and state the condition for which it will act as a constant-k band pass filter.
- (f) Explain why the components of a passive filter should be lossless components.
- (g) Explain in short the basic principle of operation of a photo-transistor.

2. (a) Convert the following  $\pi$ -network into its equivalent T-form with the derivation of the necessary formulae :

5



- (b) Design a series type Foster network equivalent to a circuit having a pole at  $\omega_1 = 1$  megaradians/sec and a zero at  $\omega_2 = 1.5$  megaradians/sec. The input impedance of the circuit being  $j 1000$  ohms at  $0.8$  megaradians/sec. 5

3. (a) Draw the cross-sectional diagram of an SCR and its circuit symbol.  $\frac{1}{2} + \frac{1}{2}$

- (b) Draw the I-V characteristics of an SCR with different gate currents in both 1st and 3rd quadrant and explain these characteristics quantitatively. 1+3

- (c) Is it possible to fabricate a similar type of device using germanium, why? 1
- (d) Suppose a transmission line of length  $l$  is excited by a sinusoidal voltage source of radio frequency with internal impedance  $Z_S$  and it is loaded by an impedance  $Z_R$  at the receiving end. Derive the general expressions for voltage and current at any point along the length of the transmission line. 5

### Group—B

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

1. Answer any five bits : 5×2
- (a) Design a circuit which can transmit a binary signal selectively into four different outputs.
- (b) Write down the binary equation which tells a binary signal  $A(A_2A_1A_0)$  is greater than a binary signal  $B(B_2B_1B_0)$ .
- (c) How the data and address are multiplexed in 8085  $\mu P$ ?
- (d) What is the difference between static and dynamic RAM?
- (e) If a baseband signal has maximum frequency 4 kHz and if 4 kHz guard band is required to avoid crosstalk then what should be the sampling frequency?

- (f) Design a simple circuit to convert 2 bit binary into analog value.
- (g) Add and subtract (+5) and (+4) by signed binary 2's compliment method.
2. (a) What do you mean by A.L.U and accumulator (A) ?
- (b) How can you expand the memory capacity from  $(16 \times 4)$  to  $(64 \times 8)$ .
- (c) What is the difference between parallel adder and 'carry look ahead' adder ? Multiply 4 by 2 in binary method.
- 3+4+3
3. (a) What are the meaning of the following instructions and what will be the value of A register after the execution of the program in 8085  $\mu$ P ?
- |     |   |    |
|-----|---|----|
| XRA | A |    |
| MVI | B | 05 |
| ORA | B |    |
| HLT |   |    |
- (b) What is sampling theorem ? What do you mean by Flat-top sampling and natural sampling ?
- (c) Describe a process of ADC with neat block diagram.
- 4+3+3