2009

PHYSICS

PAPER—1204

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

GROUP—A

[*Marks* : 20]

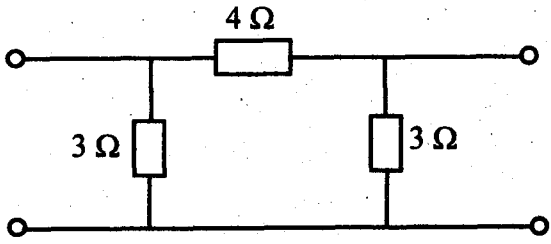
1. Answer any *five* from the following: 2 × 5

(*a*) One high-pass filter and one low-pass filter are given. How can you make a band-pass filter by their use jointly ?

(*b*) Define reflection coefficient of a transmission line and show that there will be no reflection of the incident wave, if the line is terminated by its characteristic impedance.

(*c*) A transmission line has the series impedance $Z = \alpha_1 + j\beta_1$ and shunt admittance $Y = \alpha_2 + j\beta_2$. Then obtain the expression of the attenuation co-efficient of the line.

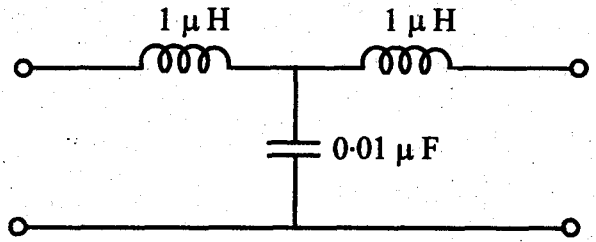
(*d*) Convert the following π-network into its equivalent T-form.



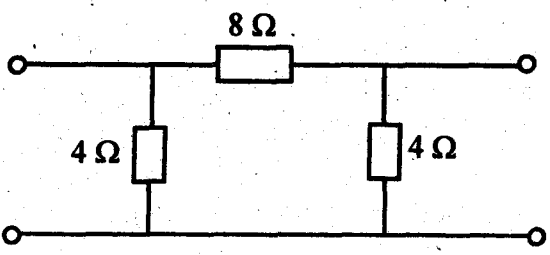
(*e*) Define iterative impedance of a T network and find out its expression.

(*f*) Write the expression of voltage standing wave ration (VSWR) in case of a transmission line. What information of the line can be obtained from this ratio.

(*g*) Show that the given circuit acts as a constant-*k* filter. Find out its cut-off frequency.



(*h*) Find the characteristic impedance of the circuit.



2. Answer any *one* bit: 10

(*a*) (*i*) Discuss the method of reducing a complicated network to a simple T-type network. When can you call a filter active one and when is it passive? 4 + 1

(*ii*) State and explain the two corollaries of Foster's reactance theorem. 5

(*b*) (*i*) Define propagation constant of a transmission line.

(*ii*) Derive the expression for α and β of a transmission line in terms of the line parameters.

(*iii*) Explain why frequency and phase distortion occurs in a transmission line.

(*iv*) Derive the condition of a distortionless line. 1 + 3 + 2 + 4

GROUP—B

(*Digital Electronics*)

[*Marks* : 20]

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

1. Answer any *five* bits: 2×5

(*a*) To signals of 1 kHz and 4 kHz are being applied to the *J* and *K* input of a JK flip-flop respectively. Draw the output waveform with the application of pulse train as a clock pulse.

(*b*) The content of a 4-bit shift-register is initially 1101. The register is shifted six times to the right, with the signal input being 101101, what is the content of the register after each shift.

(*c*) What are the different flags in ALU of 8085 μP?

(*d*) What do you mean by the following instructions in 8085 μP ?

(*i*) STA 2040 H

(*ii*) SUB B

(*iii*) ANI OF

(*iv*) INR A.

(*e*) Draw the basic structure of a 3-bit PISO register.

(*f*) For a 32 K × 20 memory unit

(*i*) What should be the length of address bus ?

(*ii*) How many FF are required to store a data taken from this memory ?

(*iii*) What is the capacity of the memory in byte ?

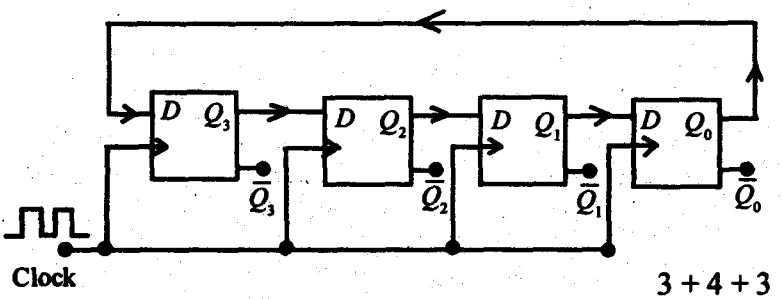
(*g*) What is PROM and what is its difference from ROM?

(*h*) Why A to D and D to A conversion units are necessary for a microprocessor kit?

2. (*a*) You have one serial data 1011. Show clearly how can you get the parallel form of it by the application of clock pulse.

(*b*) Draw the logic diagram of a 4-bit synchronous up counter and explain its operation with timing diagram.

(*c*) Draw the output waveform of Q_3, Q_2, Q_1 and Q_0 of the following circuit for 8 consequtive clock pulse.



3 + 4 + 3

3. (*a*) What is the difference between SRAM and DRAM?

(*b*) Explain the function of A/D converter with proper circuit diagram.

(*c*) Design a monostable multivibrator and explain the working principle.

(*d*) Show how to expand a 32×4 RAM unit to 128×8 RAM. $1 + 3 + 3 + 3$
