2013

DDE

M.Sc. Part–I Examination

PHYSICS

PAPER—IV

Full Marks : 75

Time : 3 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.

Write the answers Questions of each group in separate books.

Group—A

[*Marks : 40*]

Attempt *Q. No. 1, 2, 3* and any *two* from the rest.

1. Answer any *five* questions : 2×5

(a) Explain why a constant current source is needed at the input stage of an operational amplifier.

(b) Explain skip distance in radio wave communication.

(c) Define a transitional line and draw its equivalent circuit.

(d) What is Secant law in the case of radio wave propagation and what is its significance ?

(e) Explain the operation of a duplexer.

(f) What are the advantages of photo transistor over photo diode ?

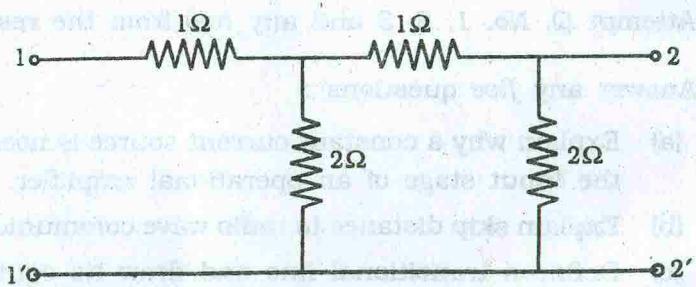
(g) Write down the expression for the refractive index of ionosphere with proper explanation of its different terms.

(h) What should be the value of slow rate of an ideal OP–AMP ? Why in a practical OP–AMP this value is not achieved ?

2. Answer any *two* questions : 3×2

(a) A 2·5 kW carrier signal is amplitude modulated (DSB–TC) by a single frequency sinusoidal signal. If the modulation index is 70%, determine the total power of the modulated wave.

(b) Find the Z-parameters of the following circuit :



(c) Explain how a band stop filter can be realised by using a given high pass filter and low pass filter ? What is the necessary condition ?

3. Answer any *one* question : 4×1

(a) Explain how the distance of a fixed target can be found by using two frequency CW Radar.

(b) Discuss the phase cancellation method for generation of SSB signal.

4. (a) Draw the circuit diagram of a constant – k band pass filter and derive the expression for its cut-off frequencies. 1+3

(b) Derive the expressions for α and β in the pass band and attencuation band. Also graphically show their variations as a function of frequency in the pass band and in the attenuation band. 4+2

5. Derive telegrapher's equation and solve it to find the expression for voltage and current in a transmission line. Hence define the reflection co-efficient of a transmission line. 8+2

6. (a) Explain the realisation of a current mirror circuit using low β transistors and show that it will behave as a current mirror circuit with necessary derivation. 5

(b) Explain how a given T-network can be converted into its equivalent π form with necessary derivation. 5

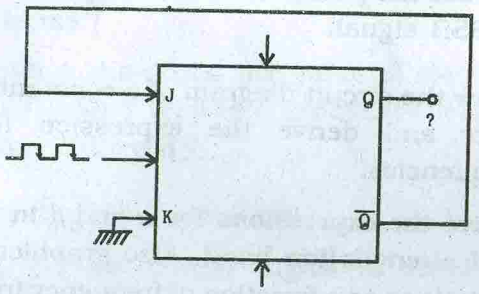
Group—B

[Marks : 35]

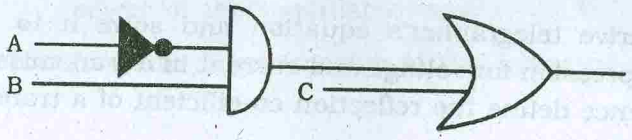
Attempt *Q. No. 1, 2* and any *two* from the rest.

1. Answer any *three* bits : 3×2

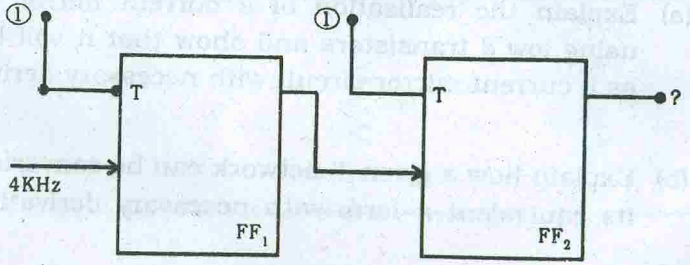
(a) What will be the output of the following circuit ?



(b) Design the following circuit with NAND gate only :



(c) Draw the output wave form of the following circuit :



(d) Write down the differences between RAM & ROM.

(e) What are the different flag registers in 8085 μP ?

2. Answer any *three* bits : 3×3

(a) Draw the circuit diagram of 3-bit synchronous counter and explain briefly.

(b) Solve the following equation with K' map :

$Y = \prod M\,(0, 2, 5, 7, 10) \cdot d\,(12, 14, 15)$

(c) Design a stable multivibrator circuit to produce square wave of $\frac{2}{3}$ duty cycle.

(d) What is sampling theorem ? If a signal has frequency spectrum of (10 – 30) KHz and 5 KHz guard band is required then what will be the sampling frequency for that signal ?

(e) Explain the address and data bus operation in 8085 μP.

3. (a) In a 4-bit input system the output is high when the LSB and MSB are in opposite phase. Draw the required Karnaugh map.

(b) Design a 3 bit bi-directional shift register and explain the working principle briefly.

(c) Design a circuit with primary gate to check whether two signal A (A_1A_0) and B (B_1B_0) are equal or not. 3+4+3

4. Give the truth table in seven :

(a) Segment display for octal number system.

(b) Describe the quantization and pulse code generation in PAM signal.

(c) Give the circuit diagram for MOD–10 counter and explain briefly. 3+4+3

5. (a) What is sequential access memory? Explain with example.

(b) What is a full adder circuit? Design the circuit of a full adder.

(c) What do you mean by SID ; TRAP ; HOLD ; R/W ; pin in 8085 μP?

(d) What will be the output of B register after the execution of the following program? 3+3+2+2

```
MVI   A   0F
MVI   C   05
ADD   C
MOV   B   A
HLT
```