This question paper contains 4 printed pages]

Your Roll No.....

1208

B.Sc. (Hons.) Physics/II Sem. A

Paper– PHHT-206

DIGITAL ELECTRONICS

Time : 3 *Hours* *Maximum Marks* : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all, including

Q. No. 1 which is compulsory.

1. Attempt any *ten* parts :

   (*a*) What are the active and passive components ? Give *one* example of each.

   (*b*) How are ICs classified on the basis of number of components ?

   (*c*) What is the meaning of virtual ground in an operational amplifier ?

   (*d*) Give the pin-out diagram of IC 741.

   (*e*) Draw the circuit diagram of XOR gate used as an odd-parity generator.

P.T.O.

(*f*) How will you obtain an OR gate using only NAND gates ?

(*g*) Convert $(175.25)_{10}$ into binary number.

(*h*) Add the numbers –8 and –4.

(*i*) Define ROM, PROM and EPROM.

(*j*) How many control lines are required to design 8 to 1 multiplexer ?

(*k*) Define accuracy and resolution of a digital to analog converter.

(*l*) Give any *two* applications of IC 555.

(*m*) Give the truth table of a full adder.

(*n*) Why D-type flip-flop is called a transparent latch ? 1½×10=15

2. (*a*) Draw the block diagram of a CRO and label all its parts.

Explain how a CRO can be used to measure : 10

(*i*) Current and

(*ii*) Phase difference.

(*b*) What do you mean by an integrated circuit ? Mention the various steps involved in the fabrication of ICs. 5

3. (*a*) Derive an expression for the gain of an operational amplifier in an inverting mode. 3

(*b*) Describe how an op-amp can be used to perform the mathematical operation of an integrator. If the input is given by $V_{in} = V_o \sin \omega t$, what is the expression for its output ? Also, draw the input and output waveforms. 7

(*c*) Draw the logic circuit for a 4-input multiplexer and explain its functioning. 5

4. (*a*) Draw a circuit diagram of an astable multivibrator using IC 555 and obtain an expression for its frequency. Obtain the condition to produce square wave. 5

(*b*) Explain the working of a R-2R ladder network based on D/A converter. How many steps are there in the output of an 8-bit D/A converter ? What is the advantages of a R-2R ladder over binary weighed resistor ? 5

(*c*) Draw the 4-bit shift register in serial-in serial-out configuration and the time diagram for the 1011 input. 5

5. (*a*) Give the truth table of JK flip-flop having preset and Clear conditions. How is racing condition eliminated in JK flip-flop ? Give the circuit diagram and explain its functioning. 4

(*b*) Draw a circuit for a decade counter and explain its functioning. 6

(*c*) Minimize the following logic expression using K-map and realize it with NAND gates : 5

$F(A, B, C, D) = \Sigma(0, 1, 2, 5, 7, 8, 9, 10, 13, 15)$.

6. (*a*) (*i*) Give an equivalent circuit of an operational amplifier.

(*ii*) Give the characteristics of an ideal operational amplifier. 5

(*b*) Draw the circuit diagram of 3 to 8 decoder and explain its functioning. 5

(*c*) Explain with an appropriate logic circuit diagram the working of a 4-bit adder/subtractor. 5

7. (*a*) Discuss the application of summing amplifier as : 5

(*i*) an adder and

(*ii*) a subtractor.

(*b*) Draw the circuit diagram of a RS flip-flop and explain its working. 6

(*c*) Explain the working of a simple decimal to BCD encoder. 4