This question paper contains 2 printed pages.

1210–A

Your Roll No. .....

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

Paper— PHHP – 206

(Digital Electronics)

Time : 1 hour *Maximum Marks* : 20

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

Attempt any twenty questions. Each question carries 1 mark.

1. Which of the following are analog quantities :
   (a) Ten-position switch (b) Altitude of an aircraft
   (c) Pressure in a car tyre (d) Timer setting on a washing machine
2. Define **(a)** a *bit*, and **(b)** a *byte*.
3. What do '74' and '00' in 74*LS*00 stand for ?
4. Draw the *circuit* of a two-input *AND* gate using *NAND* gates only.
5. Find the truth table for the following Boolean expression
$$Y = A(\overline{B + C}) + B$$
6. Simplify the following Boolean expression using Boolean algebra.
$$Y = (A + B)(\bar{A} + B)$$
7. Draw the $K - map$ for the following boolean equation
$$Y = \bar{A}\bar{B} + AB + AC + ABC$$
and simplify it.
8. What is the difference between a *Half Adder* and a *Full Adder*?
9. Make the truth table of a *Full Subtractor* and write down the Boolean expressions for *DIFFERENCE* and *BORROW*.
10. Draw the circuit of a $RS\ flip - flop$ using *NAND* gates.
11. Why is a $D\ flip - flop$ called a transparent latch ?

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12. What is a $race-around$ condition in a $JK\ flip-flop$? Name any method to overcome this condition.
13. What are the two main functions of a shift-register ?
14. Why are synchronous counters fasters than asynchronous counters ?
15. Using $JK/D\ flip-flops$ design a divide-by-6 ripple counter.
16. What is an $Encoder$?
17. In a $seven-segment\ LED$ Display, which segments will glow to display the symbol 6 ?
18. Define the resolution of a D/A converter.
19. How many bits are required for a DAC for a resolution of $20\ mV$ if the full scale output voltage is $10\ V$?
20. Give four characteristics of an ideal Op-Amp ?
21. What is the meaning of virtual ground in an Op-Amp ?
22. Draw the circuit of an inverting amplifier of gain 10 using an Op-Amp.
23. An Op-Amp has a gain-bandwidth product of $15\ MHz$. Determine the bandwidth of the Op-Amp when $A_{CL} = 500$.
24. What is the duty cycle of an astable 555 timer ?
25. Determine the frequency of a 555 oscillator for $R_A = R_B = 2.2\ k\Omega$, and $C = 2000\ pF$.