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Question Paper Code: 54B01

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Fourth Semester

Biomedical Engineering

15UBM401-ANALOG AND DIGITAL INTEGRATED CIRCUITS

(Regulation 2015)

Duration: Three hours

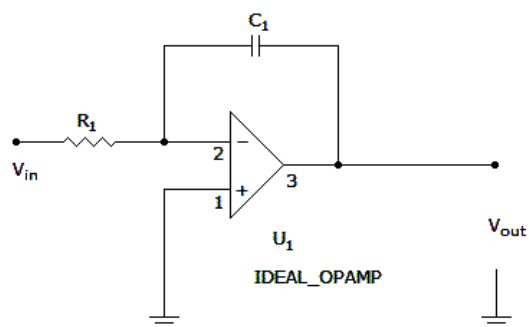
Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. What is the output waveform?

CO1-R



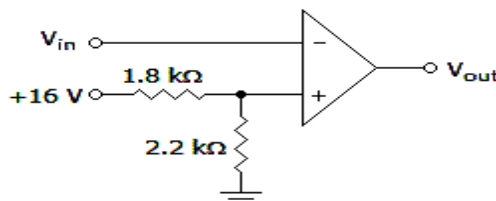
- (a) Sine wave (b) Square wave (c) Saw tooth wave (d) Triangle wave

2. An op-amp circuit in which the output voltage is equal to the difference between the two input voltages is called a(n) _____

CO1-R

- (a) Integrator (b) Differentiator
(c) Differential amplifier (d) Voltage regulator

3.

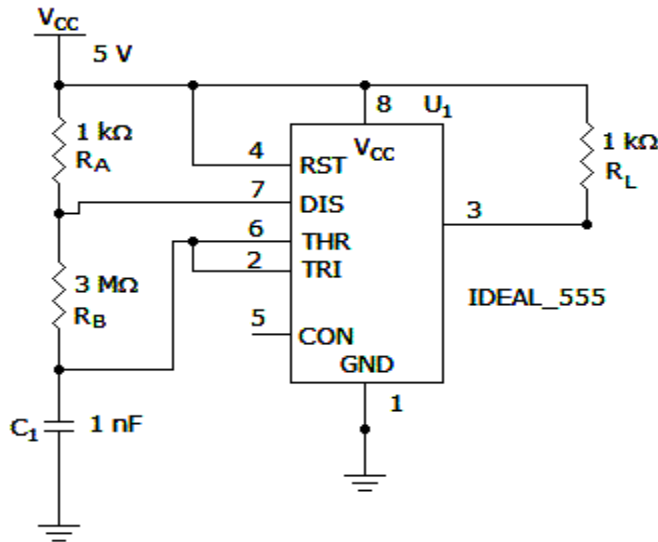


CO2-R

The reference voltage for the comparator in the given circuit equals _____.

- (a) 0 V (b) +8.8 V (c) +16 V (d) +7.2 V

4. The practical use of binary-weighted digital-to-analog converters is limited to: CO2-R
- (a) R/2R ladder D/A converters (b) 4-bit D/A converters
 (c) 8-bit D/A converters (d) Op-amp comparators
5. What is the frequency of this 555 astable multivibrator? CO3-R



- (a) 278 Hz (b) 178 Hz (c) 78 Hz (d) 8 Hz
6. In a PLL, to obtain lock, the signal frequency must: CO3-R
- (a) come within the lock range (b) be less than the capture frequency
 (c) come within the capture range (d) be greater than the capture frequency
7. How many NAND circuits are contained in a 7400 NAND IC? CO4-R
- (a) 1 (b) 2 (c) 4 (d) 8
8. Which output expression might indicate a product-of-sums circuit construction? CO4-R
- (a) $Y = \bar{A} \cdot \bar{B} = \overline{A + B}$ (b) $Y = \bar{A} \cdot \bar{B} = \overline{A \cdot B}$
 (c) $Y = A\bar{B} + C\bar{D}E$ (d) $Y = (\bar{A} + \bar{B}) \cdot (A + B)$
9. A basic S-R flip-flop can be constructed by cross-coupling which basic logic gates? CO5-R
- (a) AND or OR gates (b) XOR or XNOR gates
 (c) NOR or NAND gates (d) AND or NOR gates

10. The evolution of PLD began with CO5-R
 (a) EROM (b) RAM (c) PROM (d) EEPROM

PART – B (5 x 2= 10Marks)

11. Sketch the symbolic diagram of Operational amplifier. CO1-R
 12. Mention any four important applications of a comparator. CO2-R
 13. List the features of 555 timer IC. CO3-R
 14. Represent $(234)_{10}$ in BCD code and Excess-3 code. CO4-R
 15. Define ROM. CO5-R

PART – C (5 x 16= 80Marks)

16. (a) (i) Derive the expression for the output voltage of a three stage instrumentation amplifier and discuss its applications. CO1 -App (10)
 (ii) Explain the working of differentiator circuit using Op-Amp. CO1 -App (6)
 Or
 (b) (i) Sketch the basic circuit using an Op-Amp to perform the integrations function and analyze its output for various input functions. CO1- App (10)
 (ii) Demonstrate the working of Clipper circuit with a suitable diagram. CO1 -App (6)
17. (a) (i) Design a Schmitt trigger for $UTP = 0.5 \text{ V}$ and $LTP = -0.5 \text{ V}$. CO2 -App (8)
 (ii) Describe the working of flash type Analog to digital converter with the help of its conversion table. CO2- App (8)
 Or
 (b) (i) Educate the operations of second order low pass filter in detail. CO2-Ana (8)
 (ii) Illustrate the working of R-2R and inverted R-2R type Digital to Analog converter and mentions its merits and demerits. CO2-Ana (8)
18. (a) Draw the circuit diagram of an A-stable multivibrator to generate the output signal with frequency 2kHz and duty cycle of 75%. CO3- Ana (16)
 Or
 (b) Sketch the functional diagram and explain the operation of VCO. Also derive an expression for f_o . CO3-Ana (16)

19. (a) Using K-map, Find minimum SOP expression for the function $F = \sum m(2,5,7,10,11,14) + \sum d(1,4,15)$ CO4-U (16)

Or

- (b) Simplify the following Boolean functions X and Y to minimum number of literals and implement with NOR logic gates. CO4-Ana (16)

A	B	C	X	Y
0	0	0	1	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	0	1
1	0	1	0	1
1	1	0	0	1
1	1	1	0	1

20. (a) A sequential circuit with two JK flip flops and one input X is described by the following input equation $J_A = B$, $J_B = \bar{X}$, CO5-U (16)

$K_A = \bar{B}\bar{X}$, $K_B = \bar{A}X + A\bar{X}$ Draw state table and determine state equation of it.

Or

- (b) Implement the following three Boolean functions with a PLA CO5-U (16)

$$F_1(A,B,C) = \sum (0,1,2,4)$$

$$F_2(A,B,C) = \sum (0,5,6,7)$$

$$F_3(A,B,C) = \sum (0,3,5,7)$$