

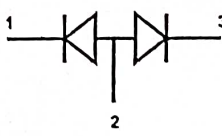
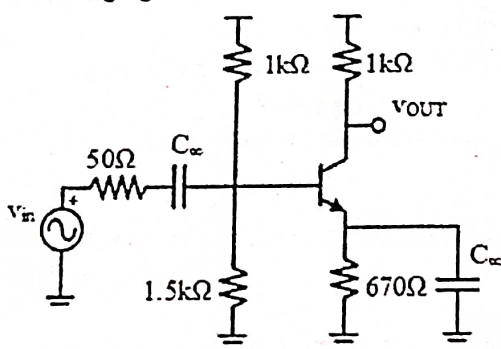
**National Institute of Technology Silchar.**  
**End-semester (UG) Examination, February-March 2023**

Subject Code: EC-101  
 Semester: I  
 Duration: Two Hours

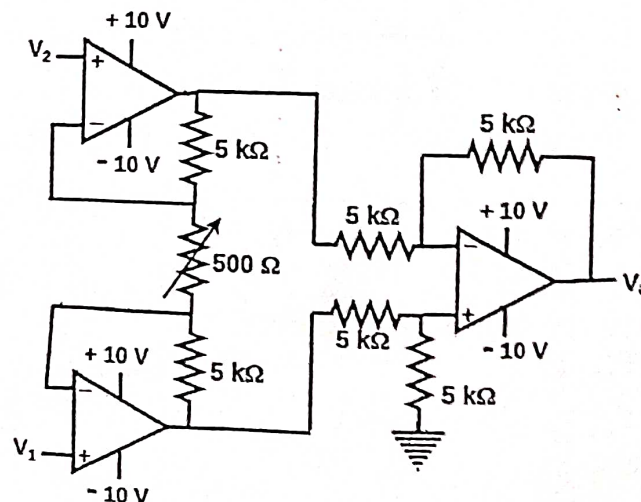
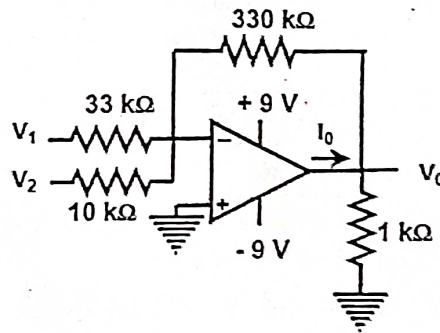
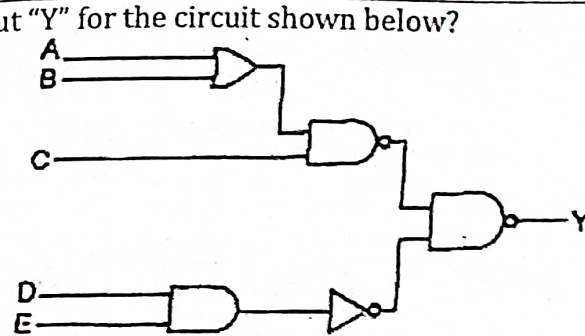
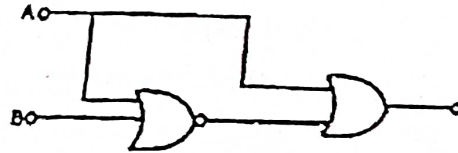
Subject: Basic Electronics  
 Department: CSE, ECE, EE.  
 Total Marks: 50

*a. Answer any 5 (five) questions.*

*b. Make appropriate assumptions where ever necessary*

S.N.	Questions	Marks	CO
1.(a)	Does the following diode combination is equivalent to an NPN BJT? Justify your answer. 	2	CO1
1.(b)	Why is Gray code used for coding the columns and rows in K-map?	2	CO5
1.(c)	Suppose an ac voltage source is supplying an input $5\sin(2\pi t)$ V to a clipper circuit, which has clipping limits +8V and -4V. Draw the circuit diagram of such a diode circuit which can be inserted between the voltage source and the said clipper circuit in order to get an unclipped i.e. 10 V peak to peak sinusoidal wave at the output of the clipper circuit?	2	CO2
1.(d)	What is the purpose of coupling and by-pass (i.e. shunt) capacitors?	2	CO3
1.(e)	What is a voltage buffer and why do we need it?	2	CO4
2.	Consider the common emitter amplifier circuit with a resistor load. It is given that: $\beta = 100$ , $T = 17^\circ\text{C}$ , $V_{CC} = 2.5\text{V}$ , $V_A = 10\text{V}$ a) Determine the DC collector current and DC voltage level of the output node. b) Calculate the small signal parameters of the BJT. c) Draw small signal circuit. d) Calculate voltage gain. 	4+2+1 +3	CO3
3.(a)	Using K-map minimize the following Boolean function- $F(A, B, C, D) = \sum m(3, 4, 5, 7, 9, 13, 14, 15)$	4	CO5
3.(b)	Using Boolean algebra reduce the Boolean expression: $A = XY + X(Y+Z) + Y(Y+Z)$	2	CO5

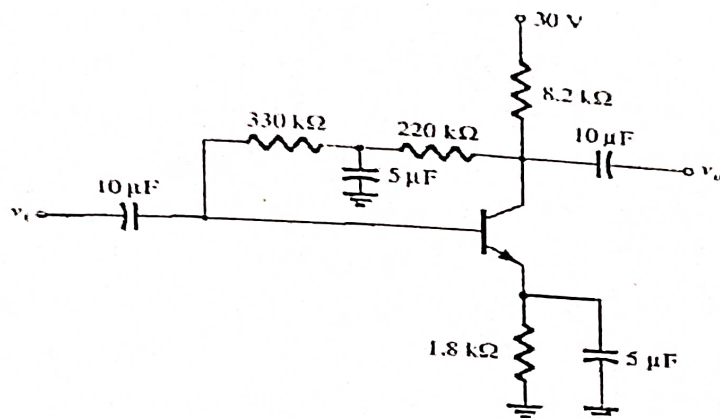
3.(c)	What is the output for the logic circuit shown below?	2	C05
3.(d)	What is the output "Y" for the circuit shown below?	2	C05
4.(a)	Calculate the output voltage $V_o$ and current $I_o$ of the following circuit, if $V_1 = -0.2$ V and $V_2 = 0$ V.	5	C04
4.(b)	The emitter current in an NPN bipolar junction transistor is 8.8 mA. It is known that only 0.85 % of the minority carriers (electrons) injected into the base recombine, and the collector reverse leakage current is 200 nA. Find (a) the base current, (b) the collector current, (c) the exact value of dc alpha, and (d) the approximate value of dc alpha.	1+2+1 +1	C01
5.(a)	Calculate the output voltage for the following circuit when $V_1 = 2.5$ V and $V_2 = 2.25$ V.	6	C04



5.(b)

For the below circuit. Find:

- a) Q-point  
b)  $V_E$

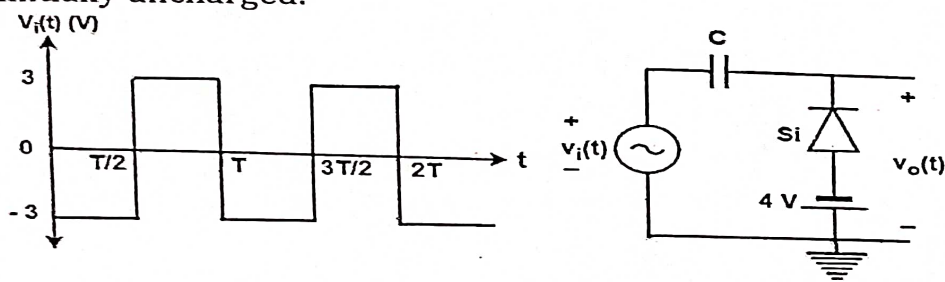


3+1

CO3

6.(a)

Find the output voltage graph for the given periodic input signal for the circuit shown in the following figure. Assume the capacitor was initially uncharged.

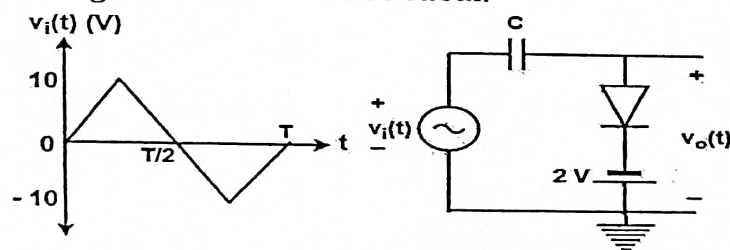


3

CO2

6.(b)

Find the output voltage graph for the given periodic input signal for the circuit shown in the following figure. Assume the capacitor was initially uncharged and diode to be ideal.

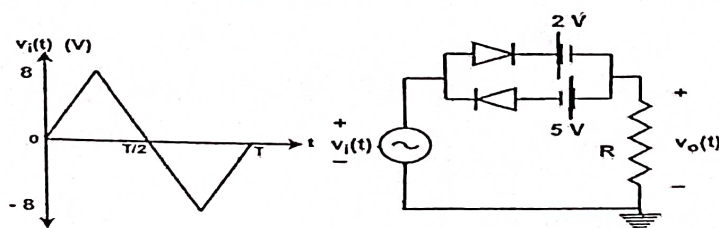


4

CO2

6.(c)

Find the output voltage graph for the given input signal for the circuit shown in the following figure.



3

CO2