Basic Electronics VTU CBCS Question Paper Set 2018

CBCS Scheme

USN | | | | | | | | | | 17ELN15

First Semester B.E. Degree Examination, Dec.2017/Jan.2018
Basic Electronics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain the operation of PN junction diode under forward and reverse biased conditions, with the help of VI characteristics curve. **(06 Marks)**

b. Derive the relation between α and β. Calculate I_C and I_E for transistor that has $\alpha_{dc} = 0.98$ and $I_B = 100\ \mu A$. **(06 Marks)**

c. With a neat circuit diagram and waveforms, explain the working of centre-tap full wave rectifier and derive the efficiency for the same. **(08 Marks)**

OR

2 a. With a neat diagram, explain the operation of PNP and NPN transistor. **(08 Marks)**

b. A half wave rectifier from a supply 230 V 50 Hz with step down transformer ratio 3:1 to a resistive load of 10 KΩ. The diode forward resistance is 75 Ω and transformer secondary is 10 Ω. Calculate the DC current, DC voltage, efficiency and ripple factor. **(06 Marks)**

c. With neat circuit diagram, explain the common emitter circuit and sketch the input and output characteristics. **(06 Marks)**

Module-2

3 a. With a necessary equation and circuit, explain the base-bias transistor circuits. **(06 Marks)**

b. Design an Adder using op-amp to give the output voltage, **(06 Marks)**

$$V_0 = -[2V_1 + 3V_2 + 5V_3]$$

c. Derive the equations for output voltage for an inverting amplifier and an integrator. **(08 Marks)**

OR

4 a. Explain the characteristics of an ideal op-amp. Mention the applications. **(06 Marks)**

b. Accurately analyze the voltage divider bias which has $V_{CC} = 18$ V, $R_1 = 33$ KΩ, $R_2 = 12$ KΩ and $R_E = 1$ KΩ. Determine V_E V_C, V_{CE}, I_C and Q point, when transistor $h_{fe} = 200$. **(08 Marks)**

c. Write short notes on op-amp virtual ground concept. **(06 Marks)**

Module-3

5 a. Perform the following:

i) Convert $(57345)_{10} = (\quad)_{16}$ **(06 Marks)**

ii) Subtract $(28)_{10} - (19)_{10}$ using 2's complement method. **(06 Marks)**

b. Realize $Y = AB + CD + E$ using NAND gate. **(06 Marks)**

c. Explain the full adder circuit with truth table. Realize the circuit for sum and carry using logic gates. **(08 Marks)**

OR

6 a. Perform the following:
   i) Convert $(FA27D)_{16} = (\quad)_2 \rightarrow = (\quad)_8 = (\quad)_{10}$
   ii) Subtract 10.0101 – 101.1110 using 1's compliment method. **(06 Marks)**

b. $Y = A + AB + AB\overline{C}$ simplify and implement using logic gates and NOR gates. **(06 Marks)**

c. State and prove De Morgan's theorem using two variable. **(08 Marks)**

Module-4

7 a. Bring out differences between flip flops and latches. **(04 Marks)**

b. Explain SR flipflop with circuit diagram and truth table. **(06 Marks)**

c. With a neat block diagram explain the architecture of 8051 microcontroller. **(10 Marks)**

OR

8 a. Explain the operation of NAND gate latch with circuit and truth table. **(10 Marks)**

b. What is stepper motor? With a neat block diagram, explain the working principle of microcontroller based stepper motor control system. **(10 Marks)**

Module-5

9 a. Define communication. With neat block diagram, explain the elements of communication system. **(06 Marks)**

b. Derive an expression for amplitude modulation and draw the necessary waveforms. **(08 Marks)**

c. What is transducer? Compare the active and passive transducers. **(06 Marks)**

OR

10 a. Bring out the difference between amplitude modulation and frequency modulation. **(06 Marks)**

b. If a FM wave represented by the equation $V = 10\sin(8\times10^8 + 4\sin 1000t)$, calculate:
   i) Carrier frequency ii) Modulating frequency
   iii) Modulation index iv) Band width **(06 Marks)**

c. With necessary diagram and equations, explain the following:
   i) Piezo-electric transducer
   ii) LVDT. **(08 Marks)**

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15ELN15/25

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Basic Electronics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Define the following diode parameters : **(05 Marks)**
   i) Knee voltage
   ii) Maximum forward current
   iii) Peak inverse voltage
   iv) Reverse breakdown voltage
   v) Maximum power rating. **(06 Marks)**

b. With neat circuit diagram and waveform explain the working of Full wave Bridge Rectifier. **(05 Marks)**

c. Draw common emitter circuit. Sketch input and output characteristics. Also explain operating regions by indicating them on characteristic curve.

OR

2 a. Write a note on voltage regulator circuit. **(05 Marks)**

b. Derive the relationship between α and β. Also calculate the α value and β value of a transistor if $I_B = 100\mu A$ and $I_c = 2mA$. **(04 Marks)**

c. With a neat diagram, explain the output characteristics of a transistor in common base configuration. **(07 Marks)**

Module-2

3 a. What is DC load line? Explain with neat circuit the operation of voltage divider bias circuit. **(05 Marks)**

b. What is op-amp? List the characteristics of an ideal op-amp. **(06 Marks)**

c. For the circuit shown in Fig Q3(c). compute
   i) Three transistor currents
   ii) Voltage drop across R_C and R_B. **(05 Marks)**

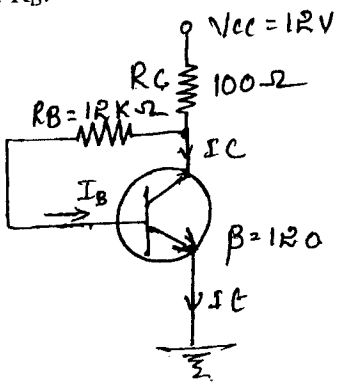

Fig Q3(b)

OR

4 a. Explain how op-amp can be used as
i) An integrator ii) Differentiator iii) Voltage follower. **(06 Marks)**

b. With neat circuit diagram, explain base biased method with necessary equations. **(05 Marks)**

c. Find the output of the following op-amp circuit. **(05 Marks)**

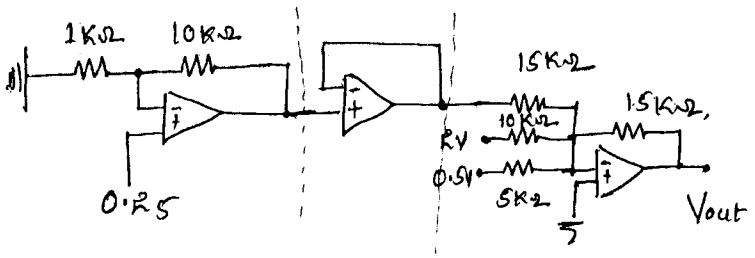

Fig Q4(c)

Module-3

5 a. Convert $(1101101)_2 = (\ )_{10}$ and $(96)_{10} = (\ )_2$. **(04 Marks)**

b. Convert $(FA876)_{16} = (\ )_8$ and $(237)_8 = (\ )_{16}$. **(04 Marks)**

c. Design Full adder circuit. **(08 Marks)**

OR

6 a. State and prove De Morgan's theorem. **(05 Marks)**

b. What are Universal gates? Realize AND, OR Gates using Universal gates. **(05 Marks)**

c. Subtract $(19)_{10}$ from $(15)_{10}$ using 1s and 2s compliment methods. **(06 Marks)**

Module-4

7 a. Write a note on NOR gate latch. **(05 Marks)**

b. Explain the working of clocked RS flip flop using NAND gates. **(06 Marks)**

c. Define microcontrollers. Write their important applications. **(05 Marks)**

OR

8 a. Explain the architecture of 8051 micro controller. **(08 Marks)**

b. Mention the difference between latch and Flip flop. **(02 Marks)**

c. Write a note on interfacing of 8051 microcontroller with stepper motor. **(06 Marks)**

Module-5

9 a. Explain the block diagram of communication system. **(05 Marks)**

b. Define Amplitude modulation. Derive mathematical expression for the same. Draw waveforms. **(06 Marks)**

c. Explain the construction and the principle of operation of LVDT. **(05 Marks)**

OR

10 a. List the differences between Amplitude modulation and frequency modulation. **(05 Marks)**

b. Explain frequency modulation with neat waveforms. **(05 Marks)**

c. A carrier of 10V peak and frequency 100KHz is amplitude modulated by a sine wave of 4V peak and frequency 1000Hz. Determine the modulation index for the modulated wave and draw the amplitude spectrum. **(06 Marks)**

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First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018

Basic Electronics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain the V-I characteristics of p-n junction diode. **(05 Marks)**

b. The input voltage applied to the primary of a 4:1 step down transformer of a full wave centre tap rectifier is 230 V, 50 Hz is the load resistance is 600 Ω and forward resistance is 20 Ω. Determine the following for circuit shown in Fig.Q1(b). **(06 Marks)**

i) dc power output
ii) Rectification efficiency
iii) PIV

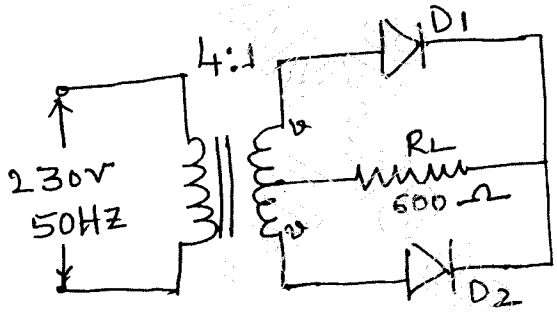

Fig.Q1(b)

c. Explain CB configuration of BJT with characteristics. **(05 Marks)**

OR

2 a. Derive an expression for ripple factor and output dc voltage of a full wave rectifier. **(06 Marks)**

b. Explain how a zener diode can be used as a voltage regulator. **(05 Marks)**

c. Obtain the relationship between α and β. Calculate the value of I_C, I_E for a transistor that has α = 0.98 and I_B = 100 μA. **(05 Marks)**

Module-2

3 a. What is DC load line? Explain collector to base biased method with necessary equation. **(05 Marks)**

b. Define the following terms with respect to op-amp: (i) Slew rate, (ii) CMRR, (iii) PSRR. **(05 Marks)**

c. Design an op-amp circuit that will produce an output equal to $-(4V_1 + V_2 + 0.1V_3)$. **(06 Marks)**

OR

4 a. With circuit diagram, explain the operation of voltage divider bias circuit with necessary equations. **(06 Marks)**

b. Derive the expression of 3-i/p summing amplifier. **(05 Marks)**

c. Draw the circuit of inverting op-amp. Derive the expression for the voltage gain. **(05 Marks)**

Module-3

5 a. Perform the following:
i) Convert $(725.25) = (\ ?\ )_{10} = (\ ?\ )_2$
ii) Subtract using 2's complement $(4-9)_{10}$
iii) $(11010.101)_2 = (\ ?\ )_8 = (\ ?\ )_{16}$ **(06 Marks)**

b. State and prove Demorgan's theorem. **(05 Marks)**

c. Simplify the expression and realize using basic gates $\overline{A}\,\overline{B}\,\overline{C} + \overline{A}BC + A\overline{B}\,\overline{C} + A\overline{B}\,\overline{C}$. **(05 Marks)**

OR

6 a. Convert:
i) $(172.625)_{10} = (\ ?\ )_{16} = (\ ?\ )_2$
ii) $(BDCE)_{16} = (\ ?\ )_2 = (\ ?\ )_8$
iii) $(10111101.0110)_2 = (\ ?\ )_{10} = (\ ?\ )_{16}$ **(06 Marks)**

b. Simplify and realize the Boolean expression using two inputs NAND gates only $(A + \overline{B} + C)(\overline{A} + B + C)$. **(05 Marks)**

c. Realize the full adder circuit for sum and carry using basic gates, explain the same with truth table. **(05 Marks)**

Module-4

7 a. Explain the operation of NAND and NOR latch with symbol, circuit and truth tube. **(08 Marks)**

b. With neat block diagram, describe the architecture of 8051 microcontroller. **(08 Marks)**

OR

8 a. What is flip-flop? Explain clocked R-S flip-flop with diagram and truth table. **(08 Marks)**

b. Explain the working principle of microcontroller based stepper motor control system. **(08 Marks)**

Module-5

9 a. What are the basic elements of communication system? Explain with neat block diagram. **(06 Marks)**

b. Distinguish between Amplitude Modulation (AM) and Frequency Modulation (FM). **(04 Marks)**

c. Explain the construction and the principle of operation of LVDT. **(06 Marks)**

OR

10 a. With relevant waveforms, explain amplitude modulation. **(06 Marks)**

b. What is a transducer? Mention four important parameters of an electrical transducer. **(04 Marks)**

c. Write short notes on:
i) Piezo electric transducer
ii) Photo electric transducer. **(06 Marks)**

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15ELN15/25

First/Second Semester B.E. Degree Examination, June/July 2016
Basic Electronics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Explain the operation of pn junction diode under forward and reverse bias condition. **(06 Marks)**

b. For a zener regulator shown in the Fig.Q.1(b), calculate the range of input voltage for which output will remain constant.

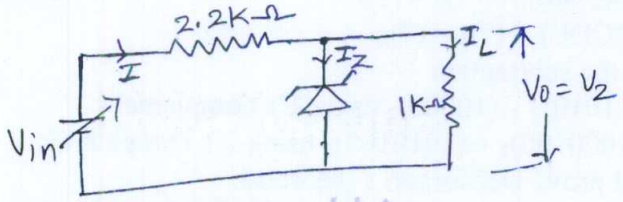

Fig.Q.1(b)

$V_z = 6.1V$, $I_{z_{min}} = 2.5$ mA, $I_{z_{max}} = 25$mA, $r_z = 0\Omega$. **(04 Marks)**

c. Sketch the transistor input and output characteristics of CE configuration and briefly explain the three regions of operation. **(06 Marks)**

OR

2 a. With circuit diagram, explain the operation of center-tapped full-wave rectifier. Draw input and output waveforms. **(06 Marks)**

b. Explain how zener diode can be used as voltage regulator. **(05 Marks)**

c. Derive the relationship between α and β. Find the values of β, α and I_E for a transistor has $I_B = 100\ \mu A$ and $I_C = 2mA$. **(05 Marks)**

Module-2

3 a. With neat circuit diagram, explain the operation of voltage divider bias circuit with necessary equations. **(06 Marks)**

b. Draw the circuit of op-amp integrator. Derive the expression for output voltage. **(06 Marks)**

c. Calculate the o/p voltage of a three input inverting summing amplifier, given $R_1 = 200K\Omega$, $R_2 = 250K\Omega$, $R_3 = 500K\Omega$, $R_f = 1M\Omega$, $V_1 = -2V$, $V_2 = -1V$ and $V_3 = +3V$. **(04 Marks)**

OR

4 a. For the circuit shown in Fig.Q.4(a) find the Q-point values and draw DC-load line, where $V_{BE} = 0.7V$ and $\beta = 50$. **(06 Marks)**

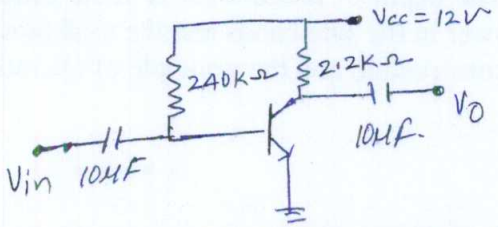

Fig.Q.4(a)

b. Draw the circuit of non-inverting op-amp. Derive the expression for the voltage gain. **(05 Marks)**

c. Define the following terms with respect to op-amp: i) slew rate; ii) CMRR; iii) PSRR. **(05 Marks)**

Module-3

5 a. Convert:
i) $(526.44)_8 = (?)_2 = (?)_{10}$
ii) $(48350)_{10} = (?)_{16} = (?)_8$ **(04 Marks)**

b. Subtract the following using 2's complement method:
i) $101011_{(2)}$ from $111001_{(2)}$
ii) $111001_{(2)}$ from $101011_{(2)}$ **(04 Marks)**

c. Simplify the following expression and realize using basic gates:
$Y = A\left(\overline{ABC} + A\bar{B}C\right)$. **(04 Marks)**

d. Realize half adder using NAND gates only. **(04 Marks)**

OR

6 a. Convert:
i) $(342.56)_{10} = (?)_2 = (?)_8$
ii) $(BCDE) = (?)_2 = (?)_8$ **(04 Marks)**

b. Perform the subtraction
i) $(11010)_2 - (10000)_2$ using 1's complement.
ii) $(1000100)_2 - (1010100)_2$ using 2's complement. **(04 Marks)**

c. State and prove DeMorgan's theorems. **(04 Marks)**

d. Write the symbol, truth table and final expression for NAND and Ex – OR gate (For two I/PS). **(04 Marks)**

Module-4

7 a. With diagram and truth table explain NAND gate latch. **(05 Marks)**

b. With diagram and truth table explain clocked R-S flip-flop. **(05 Marks)**

c. Explain the architecture of 8051 microcontroller. **(06 Marks)**

OR

8 a. What is flip-flop? Explain the operation of NOR gate latch using its truth table. **(08 Marks)**

b. With block diagram, explain microcontroller based stepper motor control system. **(08 Marks)**

Module-5

9 a. With the help of block diagram, explain communication system. **(06 Marks)**

b. With circuit diagram explain the process of AM demodulation. **(05 Marks)**

c. Explain the principle of operation of piezoelectric transducer. **(05 Marks)**

OR

10 a. Why modulation is necessary in communication system? List the different types of modulation schemes. **(05 Marks)**

b. A carrier of 1MHz, with 400 W of its power is amplitude modulated with a sinusoidal signal of 2500Hz. The depth of modulation is 75%. Calculate the sideband frequencies, the band width, the power in the side bands and the total power in the modulated wave. **(05 Marks)**

c. Explain the construction and the principle of operation of LVDT. **(06 Marks)**

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15ELN15/25

First/Second Semester B.E. Degree Examination, June/July 2017

Basic Electronics

Time: 3 hrs. Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain briefly the PN junction diode characteristics. **(06 Marks)**

b. Explain Zener diode voltage regulator circuit with no load and with load. **(06 Marks)**

c. Derive the relationship between α and β. Calculate the value of I_c for a transistor that has $\alpha = 0.98$ and $I_b = 200\ \mu A$. **(04 Marks)**

OR

2 a. Explain briefly the common emitter circuit and sketch the input and output characteristics. Also explain operating regions by indicating them on characteristics curve. **(06 Marks)**

b. With a neat circuit diagram and waveforms, explain the working of a half-wave rectifier. **(06 Marks)**

c. Explain briefly capacitor filter circuit. **(04 Marks)**

Module-2

3 a. What is a DC load line? Explain the voltage divider bias circuit. **(08 Marks)**

b. Mention and explain the characteristics of ideal operational amplifier. **(04 Marks)**

c. Derive the expression of integrator with circuit diagram. **(04 Marks)**

OR

4 a. With neat circuit and necessary equations, explain the voltage follower. **(06 Marks)**

b. Explain the base bias circuit. **(04 Marks)**

c. Explain briefly inverting and non-inverting operational amplifiers. **(06 Marks)**

Module-3

5 a. State and prove De-Morgan's theorem with truth table. **(06 Marks)**

b. Explain the basic gates AND, OR and NOT gates with truth tables. **(06 Marks)**

c. Explain the half-adder circuit. **(04 Marks)**

OR

6 a. Explain the full-adder circuit. **(06 Marks)**

b. Simplify the given Boolean equation $Y = (A + \overline{B})(CD + E)$ and realize using NAND gates only. **(04 Marks)**

c. Convert the following:

i) $(49.5)_{10} = (\quad ? \quad)_{16}$

ii) $(1062.403)_8 = (\quad ? \quad)_{10}$

iii) $(642.71)_8 = (\quad ? \quad)_2$ **(06 Marks)**

Module-4

7 a. What is R-S flip-flop? Explain its circuit diagram, logic symbol and truth table. **(08 Marks)**

b. Explain the architecture of 8051 microcontroller in detail. **(08 Marks)**

OR

8 a. Explain the gated R-S flip-flop and clocked R-S flip-flop. **(08 Marks)**

b. With the help of block diagram, explain the micro-controller based stepper motor control system **(08 Marks)**

Module-5

9 a. Explain the construction of LVDT and its operation. **(06 Marks)**

b. Explain the frequency modulation with neat waveforms. **(06 Marks)**

c. Explain with diagram the AM detection (demodulation). **(04 Marks)**

OR

10 a. Explain the piezoelectric transducer and photoelectric transducer. **(06 Marks)**

b. Explain with block diagram elements of communication system. **(06 Marks)**

c. Compare AM and FM modulation. **(04 Marks)**

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15ELN15

First Semester B.E. Degree Examination, Dec.2015/Jan.2016
Basic Electronics

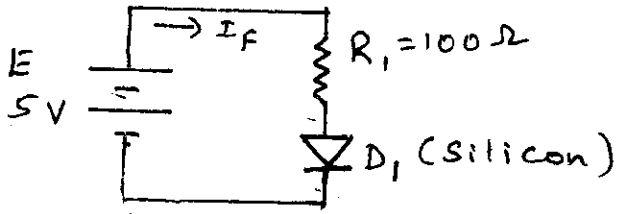
Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. For the circuit shown in fig.Q1(a) draw the DC load line and locate Q – pt. **(04 Marks)**

Fig.Q1(a)



b. What is the need for capacitor filter? For a Half – Wave Rectifier, explain the operation of C – filter. **(06 Marks)**

c. Considering npn transistor in common emitter configuration, explain how it acts as voltage amplifier. **(06 Marks)**

OR

2 a. Explain the working of a Bridge Full – Wave Rectifier, with a neat circuit diagram and waveforms. **(06 Marks)**

b. Discuss the load and line regulation using zener diode with neat circuit diagram and appropriate expressions. **(06 Marks)**

c. Calculate the values of I_C and I_E for a BJT with $\alpha_{dc} = 0.97$ and $I_B = 50\ \mu A$. Determine β_{dc}. **(04 Marks)**

Module-2

3 a. Precisely analyse the circuit of voltage divider bias and hence determine the V_C and V_{CE}. Mention the advantages of voltage divider bias. **(10 Marks)**

b. Derive an equation for output voltage for a non – inverting Op – amp. Find the gain of amplifier if $R_F = 10K\Omega$ and $R_1 = 1K\Omega$. **(06 Marks)**

OR

4 a. A base bias circuit with a 12V supply uses a transistor with $h_{FE} = 70$. Design the circuit so that $I_C = 2mA$ and $V_{CE} = 9V$ (Assume $R_E = 0$). **(06 Marks)**

b. Explain the working of Op – amp as integrator. **(05 Marks)**

c. Derive the expression of 3 input summing amplifiers. **(05 Marks)**

Module-3

5 a. Convert the following : i) $172.625_{(10)} = (\quad)_2$ ii) $(ABCD.72)_{16} = (\quad)_8$
iii) $(1\,0\,1\,1\,1\,1\,0\,1\,.\,0\,1\,0\,1)_2 = (\quad)_{10}$. **(06 Marks)**

b. Perform the following operations using 1's and 2's compliment technique
i) $(56)_{10} - (79)_{10}$ ii) $(23)_{10} - (18)_{10}$ **(06 Marks)**

c. State and prove de Morgan's theorem using truth table for 2 variables. **(04 Marks)**

OR

6 a. Explain full adder circuit with truth table. Realise the circuit for sum and carry using basic gates. Also write the diagram showing FA using two half adders. **(06 Marks)**

b. Simplify and realize the following expressions using only NAND and NOR.

i) $Y = (A + \overline{B})(B + C)(\overline{C} + \overline{B})$ ii) $Y = AB + AC + BD + CD$. **(10 Marks)**

Module-4

7 a. Explain the operation of NOR Latch with symbol, circuit and truth table. **(06 Marks)**

b. With a neat block diagram, explain the architecture of 8051 microcontroller. **(10 Marks)**

OR

8 a. How is Flip – Flop different from a Latch? Explain the gated RS Flip - Flop with symbol, circuit and truth table. **(08 Marks)**

b. Interface stepper motor to 8051 microcontroller with a neat block diagram. Explain its working principle. **(08 Marks)**

Module-5

9 a. Explain Amplitude Modulation with relevant waveforms. Derive the equation for instantaneous value of modulated signal in volts and define modulation index. **(08 Marks)**

b. Define the term transducer. Mention any four characteristics a transducer should posess. **(02 Marks)**

c. Briefly explain the working of thermistor. Mention its applications. **(06 Marks)**

OR

10 a. Explain the frequency modulation with necessary waveforms. Bring out the difference between AM and FM. **(08 Marks)**

b. Explain construction and the principle of operation of LVDT. **(08 Marks)**

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