USN

NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester B.E. (Credit System) Degree Examinations

November - December 2017

17EC112 – BASIC ELECTRONICS

ation: 3 Hours

Max. Marks: 100

*Note: Answer **Five** full questions choosing **One** full question from **each Unit.***

		Marks	BT*
	Unit – I		
a)	Illustrate the operation of a full wave rectifier circuit using two diodes with neat diagrams and waveforms. Derive the expression for average DC load voltage and RMS load voltage considering the diodes to have a forward resistance R_f and transformer winding resistance R_s.	10	L5
b)	A diode bridge rectifier has an input a c supply of 230 volts RMS and a frequency of 50 Hz. Load resistance is 250 ohms. Considering diodes to have R_f = 3 ohms, calculate: (i) average load current (ii) RMS output voltage	4	L5
c)	Explain how Zener diode is used as a voltage regulator with neat circuit diagram. Illustrate the regulation action (i) with varying input voltage (ii) with varying load resistance. Also give the necessary equations.	6	L4
d)	Explain the breakdown phenomena observed in a Zener diode.	6	L2
a)	For a full wave rectifier with capacitor filter : (i) Draw the circuit diagram (ii) Explain the operation of the circuit with relevant waveforms (iii) Derive the expression for ripple factor	10	L4
b)	A silicon diode and a germanium diode are connected in series with the diode forward resistances of 0.1 ohms and 0.56 ohms for silicon diode and germanium diodes respectively. Draw the circuit diagram. For a DC supply of 25 volts determine the forward current through the diode.	4	L5
	Unit – II		
a)	Draw the circuit for NPN transistor in Common Emitter configuration. Sketch the input and output characteristics. Mark various regions of operations and explain the operation.	8	L2
b)	Define α and β for a transistor. Derive the relationship between α and β.	6	L2
c)	Draw the circuit for base bias circuit for the transistor. Draw the DC load line and determine the Q point for given specifications: V_{cc} = 18 V, R_c = 2.2 KΩ and I_B = 40 μA.	6	L2
d)	A certain transistor circuit has collector current of 16 mA. The transistor has α_{dc} = 0.98. Calculate: (i) The base current and β_{cc} (ii) For the same base current, if the transistor is replaced by another transistor with β_{dc} = 200, calculate the new values of emitter and collector current.	6	L4
a)	Draw the circuit for a NPN transistor connected in Common Base configuration with directions of collector and base currents. Sketch the input and output characteristics. Explain various regions of operations.	8	L2
b)	Sketch the base bias circuit for a transistor. With necessary equations for Ic, I_B and output voltage V_{CE}, explain the circuit operation.	6	L2
	Unit – III		
a)	Discuss the concept of voltage series negative feedback with neat block diagram. Derive the expression for closed loop voltage gain. Mention the advantages of negative feedback.	8	L4

P.T.O.

b) Explain the operation of single stage RC coupled amplifier with neat circuit diagram. Explain the significance of each component and draw the waveforms for input and output signals. 8

c) An amplifier having an absolute voltage gain of 10 is cascaded with a power amplifier having absolute power gain of 10. Calculate the overall gain in dB. 4

6. a) With neat circuit diagram explain the operation of Hartley oscillator. Also give the expression for frequency of oscillations, β, A_V. 8

b) For the following oscillator which has $C_1 = 40pF$, $C_2 = 10$ pF and L = 3 mH. Calculate: (i) The frequency of oscillations (ii) Feedback factor β (iii) Gain required for sustained oscillations. Identify the circuit. 6

c) State and explain the Barkhausen criterion for the generation of sustained oscillations with necessary diagrams. 6

Unit – IV

7. a) Explain how an OPAMP can be used as an inverting adder with neat circuit diagram and derive the expression for the output voltage. 8

b) Explain (i) Amplitude Modulation
(ii) Frequency Modulation
with necessary waveforms. 8

c) For a non-inverting amplifier using OPAMP, the amplifier gain is 61. Determine the value of feedback resistor R_f. Consider R_1 = 1 KΩ. Draw the circuit with values. 4

8. a) Discuss the need for modulation. With neat diagram explain the basic communication system. 8

b) With neat sketch explain the OPAMP as a non-inverting amplifier and derive the expression for the output voltage. 8

c) Prove that output signal of a voltage follower circuit follows the input signal exactly. With neat diagrams explain the operation of the voltage follower circuit. 4

Unit – V

9. a) (i) Convert $(475.25)_8$ to its decimal equivalent
(ii) Subtract $(1110)_2 - (1010)_2$ using 2's complement method 6

b) Draw the symbol and truth tables for: (i) OR gate
(ii) AND gate
(iii) INVERTER
(iv) NAND gate 8

c) Implement Half adder using basic gates. Write the truth table and obtain the expressions for Sum and Carry. 6

10. a) Perform the following operations: (i) $(724)_8 = (?)_2$
(ii) $(110111001)_2 = (?)_8$
(iii) $(100.974)_{10} = (?)_2$ 6

b) Explain Full adder with truth table and derive expressions for sum and carry. Implement the circuit using basic gates. 8

c) Implement the following expressions using basic logic gates:
(i) $Y = \overline{(A+B)C}\,D$ (ii) $Y = (A + C)(\bar{B} + D)$ 6

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester B.E. (Credit System) Degree Examinations

Make up Examinations – January 2017

16EC112 – BASIC ELECTRONICS

Duration: 3 Hours Max. Marks: 100

*Note: 1) Answer **Five** full questions choosing **One** full question from **each Unit.***
2) Unless stated, consider devices as ideal.
3) Assume missing data suitably.

			Marks	BT*
		Unit – I		
1.	a)	What is meant by piecewise linear characteristic with reference to a diode? Plot the piecewise linear characteristic of a Silicon diode with a dynamic resistance of 0.2 Ω for ΔI_F of 200 mA.	6	L*4
	b)	Draw the circuit of a full wave rectifier using two diodes with resistive load. Explain the rectification operation with the help of waveforms of input voltage and output current. Considering the diodes to be practical, derive the expressions for dc load current and dc load voltage.	10	L4
	c)	A full wave rectifier consists of two diodes each having forward resistance of 500 Ω and a resistive load of 2 KΩ. The transformer secondary voltage with reference to center tap is 280 V. Calculate i) Peak load current ii) dc load current.	4	L4
2.	a)	Sketch V-I characteristic of a Silicon diode. Mark cut-in voltage, dynamic resistance and reverse breakdown voltage on the characteristic and explain the significance of the same.	6	L3
	b)	With relevant circuit diagrams and waveforms, explain how a capacitor filter reduces the magnitude of ripple in the output of a two diode full wave rectifier. Derive the expression for ripple factor. In a two diode full wave rectifier, load resistance = 2 kΩ, input frequency = 50 Hz and capacitor filter = 500 μF. The voltage applied to the diodes is 200-0-200 V. Calculate the ripple factor.	10	L3
	c)	A Zener diode voltage regulator has supply voltage, Vs = 20V, the resistance in series with the d.c supply = 200 Ω, the load resistance, R_L= 1 KΩ, reverse breakdown voltage of Zener, V_Z = 10 V. Calculate the current from d.c. supply, Is and current through the Zener diode, I_Z.	4	L4
		Unit – II		
3.	a)	Draw the common-emitter circuit for an NPN transistor and sketch the input and output characteristics. Also, explain its operation.	08	L2
	b)	The NPN transistor has I_C =2.55 mA and I_E = 2.5 mA. Determine the value of α, β and I_B.	06	L1
	c)	Using suitable sketch explain the characteristics of SCR for forward bias with the effects of I_G levels.	06	L2
4.	a)	Draw the common-base circuit for an NPN transistor and sketch the input and output characteristics. Also, indicate and explain the operating regions.	08	L2
	b)	Draw the base bias circuit with R_C=2.2kΩ, R_B=470kΩ, V_{CC}=18V, β=100, V_{BE}=0.7V and find I_B, I_C and V_{CE}.	06	L2
	c)	With the help of circuit diagram and waveforms discuss the operation of SCR pulse control circuit.	06	L3
		Unit – III		
5.	a)	Sketch frequency response of R-C coupled amplifier. Mark lower cutoff frequency and upper cutoff frequency. Indicate also Bandwidth of Amplifier. Explain the reason for gain not being the same for all frequencies.	10	L4

P.T.O.

b) Draw the circuit of Colpitts Oscillator and explain. Give the expression for output frequency. 6

c) Three amplifiers are in cascade. Absolute power gains are 100 and 1000 of the first and second. The third has gain of 20 dB. Calculate overall gain in dB. 4

6. a) Draw the block diagram of Series Voltage Negative feedback amplifier. Explain operation of this amplifier. Derive expression for closed loop gain. 8

b) List and explain merits and demerits of series voltage Negative feedback Amplifier. 6

c) R-C phase shift oscillator has $R_1=R_2=R_3=5K\Omega$ and $C_1=C_2=C_3=0.01\mu F$. Determine output frequency and feedback factor, if gain of amplifier is 100. 6

Unit – IV

7. a) List the properties of an ideal Op-amp. 6

b) Explain the principle of amplitude modulations with waveforms. 6

c) Draw a neat block diagram of CRT and explain the detailed function of each. 8

8. a) Design an inverting amplifier using Op-amp with a closed loop voltage gain of -15. 6

b) Derive the expression for output voltage of Op-amp as summer. 6

c) Draw the block diagram of communication system and explain the function of each stage. 8

Unit – V

9. a) Perform the following operations: (i) $(615)_8 = (?)_{10}$ (ii) $(CAD.BF)_H = (?)_{10}$ 4

b) Realize: (i) Exclusive OR gate using basic gates. Write the truth table.
(ii) Explain OR gate and NOR gate with truth tables. 8

c) Explain Full adder with truth table and derive expressions for sum and carry. Implement the circuit using basic gates. 8

10. a) Perform the following binary subtractions using 2's complement method: 6
(i) 1010-111 (ii) 110-1101

b) Implement Half adder using basic gates. Write the truth table and obtain the expressions for Sum and Carry. 6

c) Implement the following Boolean expression using logic gates and also write the truth tables: 8
(i) $Y = AB + \bar{A}C + BC$
(ii) $Y = C(B + C)(A + B + C)$

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

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Second Semester B.E. (Credit System) Degree Examinations

April – May 2017

16EC112 – BASIC ELECTRONICS

Duration: 3 Hours **Max. Marks: 100**

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

			Marks	BT*.
		Unit – I		
1.	a)	Draw and explain the VI characteristics of a silicon P-N junction diode.	6	L*2
	b)	A Full wave Rectifier with a load of 2 kΩ. The ac voltage applied to the rectifier is 200-0-200 V. Assuming diodes are ideal, calculate i) Average load current ii) Average Load voltage iii) DC output power iv) Rectification Efficiency	8	L4
	c)	Discuss Zener and Avalanche breakdown in diodes.	6	L2
2.	a)	What is the need of capacitor filter? For a full wave rectifier, explain the operation of C filter. Derive expression for ripple factor and output average d.c. voltage.	8	L2
	b)	Sketch reverse V-I characteristic for Zener diode. Mark important parameters and explain their significance.	6	L3
	c)	Design a Zener diode voltage regulator to meet the following specifications. V_i= 8 -12V, I_{Zmax}=80 mA $V_0=V_z$= 5V, I_{Zmin}=5 mA, , Load current=0 - 20 mA.	6	L4
		Unit – II		
3.	a)	Derive the relations between α_{dc} and β_{dc} Calculate values of α_{dc}, β_{dc}, I_B for transistor which has I_c=2.5 mA, I_E=2.55 mA.	6	L4
	b)	Draw and explain the input and output characteristics of common emitter configuration. Mark different regions of operation in the output characteristics.	8	L2
	c)	Sketch SCR forward and reverse characteristics. Briefly explain.	6	L2
4.	a)	Considering npn transistor in common emitter configuration, explain how it acts as voltage amplifier.	6	L3
	b)	In a base bias circuit of NPN transistor, R_C =2.2 kΩ, R_B = 240 kΩ. Find the Q point values and draw the DC load line, where V_{BE}=0.7 V, β=50 and V_{CC}=12 V.	6	L4
	c)	Draw the circuit schematic of a 90^0 SCR phase control circuit. Explain its operation with necessary load waveform.	8	L2
		Unit – iii		
5.	a)	What is negative feedback? What are the advantages of negative feedback?	6	L1
	b)	Draw the circuit of Hartley oscillator using BJT and explain the significance of each component.	8	L2
	c)	In a colpitts oscillator C_1=40 μF, C_2=10 μF and L=3 mH. Calculate the i) Frequency of oscillation ii) Feedback factor iii) Gain required for sustained oscillations	6	L4
6.	a)	State and explain the Barkhausen criterion for sustained oscillations.	4	L1
	b)	Calculate the closed loop gain for the negative feedback amplifier when open loop gain, A_V=100000 and B=1/100. Also calculate the closed loop gain when open loop gain is changed by ±50%.	4	L4
	c)	Draw the circuit of RC phase shift oscillator and explain the significance of each component.	6	L2

P.T.O.

d) Sketch and explain the frequency response of RC coupled amplifier. Mark upper and lower cut-off frequencies and bandwidth.

Unit – IV

7. a) List the characteristics of ideal op-Amp.
   b) Derive the output expression for
      i) Inverting operational amplifier ii) Differentiator
   c) What is modulation? Give the comparison between AM and FM.

8. a) With neat block diagram explain the working of cathode ray oscilloscope.
   b) With the cross section of Cathode Ray Tube, explain the functions of different parts.
   c) Write the expression for output voltage at points A,B,C,D as shown in Fig. 8(c).

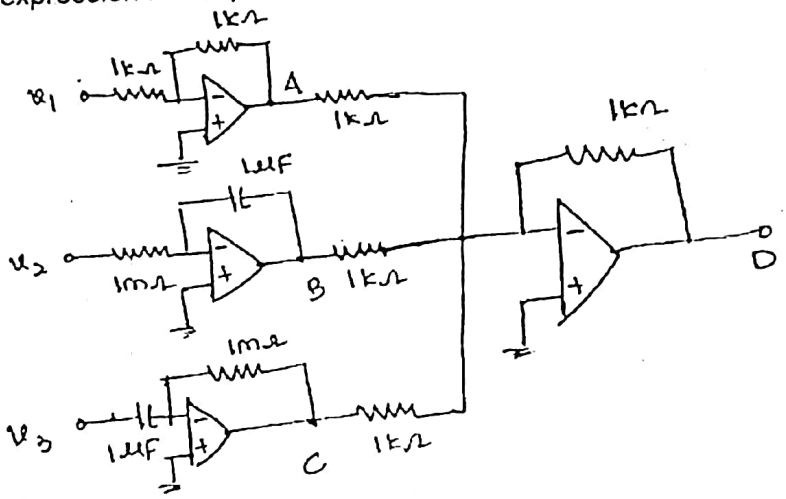

Fig. 8(c).

Unit – V

9. a) Explain Octal and Hexadecimal number systems.
   b) Perform the following operations
      i) $(526.44)_8=(?)_2=(?)_{10}$
      ii) $(48350)_{10}=(?)_{16}=(?)_8$
      iii) $(10110101001.101011)_2=(?)_{16}$
   c) Explain 4 bit parallel Binary adder with block diagram and example.
   d) Write the symbol and truth table of XOR gate.

10. a) Subtract the following using 2's complement subtraction.
      i) $(56)_{10}-(79)_{10}$ ii)$(1000100)_2-(1010100)_2$
   b) What is the difference between Full Adder and Half Adder? With truth table and logical expressions, give the design of a Full Adder circuit. Realize the circuit using 2 half adders and OR gate.

BT* Bloom's Taxonomy, L* Level

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First / Second Semester B.E. (Credit System) Degree Examinations

Make up / Supplementary Examinations - July 2017

16EC112 – BASIC ELECTRONICS

Duration: 3 Hours

Max. Marks:100

*Note: 1) Answer **Five full** questions choosing **One full** question from **each Unit**.*
2) Unless stated otherwise, consider devices to be ideal

Unit – I

		Marks	BT*
a)	Draw the circuit diagram of diode bridge rectifier with resistive load and explain operation . Sketch waveforms of input voltage and output current . Considering diodes to have conducting resistance , R_F , derive expressions for output average D C voltage and output RMS current .	10	L*3
b)	Sketch the reverse V— I characteristic of a Zener Diode . Mark important parameters on the same and explain their significance.	6	L2
c)	A Zener of **Vz = 5 volts** is used with a D C supply of **10 volts** in a loaded Zener voltage regulator . The resistance in series with the input is **100Ω.** Zener has **Iz min = 10 mA** and $P_{z\,max}$ **= 0.5 watt** . Calculate minimum value of load resistance .	4	L4
a)	Sketch forward and reverse V-I characteristics of silicon diode . Mark cut in voltage , dynamic resistance and reverse break over voltage . Define the above parameters .	8	L2
b)	Explain the purpose of a D C load line in analysis of diode circuit operating in forward bias from a D C supply with a series resistance . Write the equations for drawing the load line and explain . Show how the forward current and voltage across can be obtained .	8	L4
c)	A germanium diode having a dynamic resistance , **rd = 10 Ω** is connected in series with a load resistance , **RL = 200 Ω** across a D C supply of **20 volts** . Determine the value of current in the load resistance .	4	L5

Unit – II

Define α_{dc} and β_{dc} for a transistor . Derive the expression for α_{dc} in terms of β_{dc} as well as β_{dc} in terms of α_{dc} . A transistor has a base current of **100 µA** and α_{dc} of **0.98** . Calculate the value of emitter current . — 8 L4

Draw the circuit of NPN transistor in common emitter configuration . Sketch family of input characteristics and output characteristics . Identify different regions of operation on output characteristics . What is their significance ? — 8 L4

A silicon transistor in CE configuration has β_{dc} **= 100** . The collector circuit power supply is **15 volts** . Collector resistor R_c **= 500 Ω** and base bias resistor R_b **= 100 kΩ** . Obtain the value of voltage across collector and emitter . — 4 L5

4. a) Draw circuit of NPN transistor in common base configuration. Sketch input and output characteristics. Show the different regions of operation and explain their relevance. 8

b) Show the circuit of Automatic Heater control using SCR . Explain the working of this circuit and also sketch waveform of voltage across the heater coil . 8

c) A germanium transistor having $\beta_{dc} = 100$ in CE configuration has a base current of 200 µA .If collector circuit power supply is 20 volts determine the value of collector Resistor R_c for the circuit to work with maximum symmetrical output swings as amplifier . 4

Unit – III

5. a) Sketch frequency response of R–C coupled amplifier . Mark lower cut – off and upper cut – off frequencies and Bandwidth on the same . Explain the reason for fall in gain for low and high frequencies . 8

b) With a block diagram , explain operation of a Series Voltage Negative feedback amplifier . Derive expression for closed loop voltage gain . 8

c) Three voltage amplifiers are cascaded . The first and third have dB gain of 10 and 30 respectively . The overall gain is 60 dB . Calculate the dB gain of the second amplifier . 4

6. a) Draw the circuit of R–C phase shift oscillator and explain operation . Give the expression for output frequency . 6

b) With a block diagram , explain operation of a positive feedback voltage amplifier . Derive expression for closed loop gain . State Barkhausen criteria for an oscillator . 8

c) A Colpitts Oscillator has L = 15µH , C_1 = 0.01µF and C_2 = 0.001µF . Calculate (i) output frequency (ii) feedback factor and (iii) minimum gain of Amplifier for sustained oscillation . 6

Unit – IV

7. a) Draw circuit of inverting OPAMP Integrator and derive expression for output voltage . Sketch the output waveform along with input waveform , if input is a sine wave . 8

b) An inverting OPAMP adder has two inputs , V1 = + 2 volts with series resistance , R1 = 10 kΩ and V2 = – 6 volts with series resistance , R2 = 20 kΩ . Feedback resistance is 40 kΩ and d.c power supply is ± 9 volts . Determine output voltage for above inputs . What is the output voltage if input , V1 =0 ? 6

c) Explain amplitude modulation in a communication system with sketches of waveforms . 6

8. a) With a block diagram, explain the operation of a Cathode Ray Oscilloscope 8

b) With a circuit diagram, derive expression for output voltage for an inverting OPAMP ADDER having two inputs . 8

c) An inverting OPAMP amplifier has an input of **– 1 volt** and power supply is **± 15 volts** . If the feedback resistor , R_f = **20 kΩ** (i) What value of input resistor is required to get an output of **+ 5 volts** ? (ii) If R_f is changed to **100 kΩ** and input resistor is that obtained for part (i) , what will be the value of output voltage ? 6 L5

Unit – V

a) Convert the following :–
(i) $(398.75)_{10} = (\ ?\ )_2$ and (ii) $(7084)_{10} = (\ ?\ )_{16}$ 6 L3

b) Using **2's complements** perform (i) $(10010)_2 - (10011)_2$ and
(ii) $(11010)_2 - (1101)_2$ 6 L4

c) Show block diagram of **FULL ADDER** with inputs and outputs . Write the **TRUTH TABLE** . Show the realization of the same using **HALF ADDERS** . 8 L5

a) Draw the logic symbols of **2** input **Basic Gates** . Give their output expressions in terms of inputs and show their **TRUTH TABLES** . 6 L3

b) Convert the following :–
(i) $(7463)_8 = (\ ?\ )_2$ and (ii) $(\ 110111101.01\ )_2 = (\ ?\ )_{16}$ 6 L4

c) Show block diagram of **HALF ADDER** with inputs and outputs . Explain difference between the **HALF ADDER** and **FULL ADDER** . Write the **TRUTH TABLE** for **HALF ADDER** . Show the realization using **Basic Gates** . 8 L5

Bloom's Taxonomy, L* Level

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