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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 2016

15EC112 – BASIC ELECTRONICS

ration: 3 Hours

Max. Marks: 100

*Note: 1) Answer **Five full** questions choosing **One full** question from **each Unit**.*
2) Missing data if any may be suitably assumed.

Unit – I

		Marks	BT*
a)	With circuit of a 2 diode full wave rectifier with resistive load, explain operation. Sketch waveforms of input voltage and output voltage. Considering diodes to be ideal, derive expressions for output average D C voltage and output RMS voltage.	10	L*3
b)	Draw circuit of loaded Zener Voltage Regulator. Write expressions in terms of DC supply voltage (Vs) and Zener voltage (Vz) for I_s, current from D C supply and I_L, the current in load resistance	6	L4
c)	A full wave rectifier is having a capacitive filter. The load resistance is 500 Ω and supply frequency is 50 Hz. Determine capacitance value required for ripple factor to be 5%.	4	L3
2 a)	Sketch two approximations of forward V-I characteristics of silicon diode. Mark cut in voltage and dynamic resistance and explain. Show the electrical equivalent representations.	6	L4
b)	With circuit diagram, explain operation of diode bridge rectifier with resistive load. Sketch waveforms of input voltage and output current. Derive expressions for average load current and power efficiency considering diodes to have conducting resistance equal to R_f.	10	L3
c)	Circuit of Qn. 2b) has AC supply of **230 volts (RMS)** and average load current of **500 milliampere**. Assume diode to be silicon. Calculate value of load resistance .	4	L2

Unit – II

3 a)	Using relations between I_C, I_B, & I_E; derive an equation between α_{ac} and β_{ac}	8	L4
b)	Calculate the α_{ac} and β_{ac} for the transistor, if measured value of I_C is 1mA and of I_B is 25 μA. Determine new base current, if new I_C = 5mA.	6	L3
c)	Draw the typical output characteristics of common base NPN transistor and indicate the different parameters and their ranges.	6	L2
4 a)	For the transistor circuit shown here, sketch the transistor I_C Vs V_{CE} Characteristicsin the range V_{CE}=20V, I_C=3mA. (Assume for every increase I_B = 10 μA, I_C increases by 0.5 mA) and on this sketch draw dc load line & find the best Q point (I_{BQ}, I_{CQ}, V_{ECQ}, V_{BC}).	8	L4

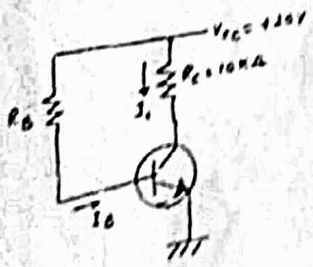

fig 4 a)

P.T.O.

b) For a SCR, discuss the forward bias operation for different supply voltages and gate currents, considering the forward & reverse biased junctions in the SCR.

c) How is the heat, generated by an electrical heater, controlled by a SCR? Draw a circuit and explain its working.

Unit – III

5. a) Sketch and explain the frequency response of RC coupled amplifier.

b) With the help of neat block voltage diagram, derive the expression for closed loop voltage gain of series negative feedback amplifier.

c) Three amplifiers with absolute voltage gains of 20, 50 and 200 are connected in cascade. Calculate

(i) Overalll voltage gain in decibels.

(ii) The output peak to peak voltage when the input voltage is 10 μV

6. a) Sketch the circuit diagram of Hartley oscillator and explain its operation. Give the expression for frequency of oscillations.

b) Discuss the effects of voltage series negative feedback.

c) In a transistor Colpitt's oscillator, L = 10 mH, calculate the value of C= C1 = C2 whose frequency of oscillations is 40 kHz.

Unit – IV

7. a) With a neat circuit diagram explain the working of op-amp Integrator and derive the expression for output voltage.

b) For an op-amp inverting amplifier circuit R_1=10kΩ, R_f = 240kΩ biased with ±15Vsupply, calculate (i) Gain of op-amp (ii) peak value of output voltage if input is sine wave with peak of 1mV (iii) Draw the output and input wave forms.

c) Define amplitude modulation and frequency modulation. Considering a carrier signal and input signal show the respective modulated output waveforms.

8. a) Draw the schematic block diagram of communication system and explain the detailed function of each block.

b) Design a non-inverting amplifier with a closed loop gain of 10. Calculate the input voltage to get an output voltage of 2 V.

c) With a neat circuit diagram show how an op-amp can be used as an inverting adder of v_1 and v_2. Arrive at the expression for output.

Unit – V

9. a) Perform the following operations.

i) $(125)_8 = (?)_2$ ii) $(1000)_{16} = (?)_{10}$ iii) $(8000)_{10} = (?)_{16}$

b) Convert following numbers to binary

i) $(63.125)_{10}$ ii) $(A00.02)_{16}$

c) Subtract $(111001)_2$ from $(101011)_2$ using 2"s complement method.

10. a) State Demorgan's theorems and prove them using Truth table.

b) Draw logic circuits to realize Y using basic gates

i) $y = ABC + A\bar{B}C + AB\bar{C} + \bar{A}BC$

ii) $y = (\overline{A+B}).(\overline{A}+\overline{C}).(\overline{B}+C)$

c) Realize NOT, AND, OR using only NAND gates.

d) Draw Truth table for half adder and design this Half adder using Basic gates.

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 2016

15EC112 – BASIC ELECTRONICS

n: 3 Hours

Max. Marks: 100

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

Unit – I

		Marks	BT*
)	Sketch V—I characteristics of an ideal diode and two approximate characteristics for a germanium diode. Show the electrical equivalent circuits for the two approximations and explain with reference to characteristics.	8	L*3
)	Define ripple factor for a rectifier. With sketches of waveforms explain how capacitor filter at the output of a full wave rectifier reduces the output ripple magnitude. Derive ripple factor for a full wave rectifier having capacitor filter using approximate analysis.	8	L3
c)	A diode bridge rectifier has an input a.c. supply of 230 V rms and frequency of 50 Hz. Load resistance is 250 ohms. Considering diodes to have R_f = 3 ohms, calculate (i) average load current and (ii) r m s output voltage .	4	L4
a)	With circuit diagram and waveforms of input voltage and output current, explain the operation of a half wave diode rectifier feeding a resistive load. Derive expressions for output current and output voltage regulation considering diode to have conduction resistance of R_f.	8	L3
b)	Discuss the different types of junction break down that can occur in a reverse biased diode. Show the symbol of Zener diode and sketch the reverse V—I characteristic with important parameters marked on it. Explain their significance.	8	L3
c)	A Zener diode voltage regulator has Vs, d.c. supply = 20V, R_s the resistance in series with d.c. supply = 200 ohms, R_l, the load resistance is 1 k ohm. Reverse breakdown voltage of Zener, V_z = 10 V. Calculate Is, the current from d.c. supply and current in the Zener diode, Iz. Show the circuit with values.	4	L4

Unit – II

a)	Draw the circuit symbols for NPN and PNP transistors. Show the current directions and voltage polarities for both to operate in active region.	6	L1
b)	A certain transistor circuit has collector current of 16 mA. The transistor has α_{dc} = 0.98. (i) Calculate the base current and β_{dc} (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
c)	For NPN transistor sketch the common emitter input and output characteristics, showing various regions of operations and explain.	8	L2
a)	In a base bias circuit of NPN silicon transistor, voltage across R_C is 4 V. The DC operating point of the circuit is V_{CEQ} = 6 V and I_{CQ} = 2 mA. Calculate the supply voltage and the value of R_C, R_B required in the circuit. Assume β = 100.	6	L3

P.T.O.

b) Draw the VI characteristics of SCR and explain it. 6 L2

c) With circuit diagram and waveforms, explain SCR firing circuit to provide 90° phase control in a half wave controlled rectifier. 8 L2

Unit – III

5. a) Draw the block diagram of series voltage negative feedback amplifier and derive its closed loop voltage gain. Also state any two advantages of this circuit. 8 L2

b) Explain the frequency response of RC coupled amplifier with a neat diagram. Define cutoff frequencies. 8 L2

c) Calculate the closed loop gain for the negative feedback amplifier when open loop gain, AV = 200000 and feedback factor B = 0.01. Also calculate the closed loop gain when the open loop gain is changed by +25%. 4 L4

6. a) Explain the working of Hartley oscillator with the help of circuit diagram and give the expressions for frequency of oscillations and gain. 8 L2

b) What are the two statements of Barkhausen criterion? Explain them. 6 L2

c) Calculate the value of R in a RC phase shift oscillator for frequency of oscillations of 2 kHz and C = 0.1μF. Draw the circuit diagram indicating all the values. 6 L

Unit – IV

7. a) Draw the circuit diagram of an inverting amplifier using opamp. If R_1=1 kΩ, R_f=10 kΩ, V_{cc}=±10V, Calculate gain of the amplifier. Also calculate the output voltage when input voltage of 2V is applied. 6 L

b) Write the general block diagram of communication system and explain each block. 8

c) List out the characteristics of ideal opamp. 6

8. a) With the block diagram of CRO, explain the functions of each block. 8

b) Explain the principle of frequency modulation with suitable waveforms. Compare AM over FM. 8

c) A sinusoidal signal with peak value of 6mV and 2 kHz frequency is applied to the input of an ideal inverting opamp amplifier with R_1=20 kΩ. Calculate the value of R_f to obtain output sine wave of peak magnitude 60mV. Draw the circuit diagram with all values marked in it. 4

Unit – V

9. a) Subtract $(101101)_2$ from $(11010)_2$ using 2's complement method. 6

b) Perform the following. i) $(249.75)_{10} = (?)_8$ ii) $(7356)_8 = (?)_2$ 6

c) Implement Full adder using two Half adders. Obtain the equations for Sum and Carry. 8

10. a) Show the symbols and write truth tables for basic gates. 6

b) Perform the following operations
i) $(1013)_{16} = (?)_{10}$ ii) $(6451)_{10} = (?)_2$ iii) $(A00.13)_{16} = (?)_2$ 6

c) (i) Using basic gates, realize an exclusive OR gate. Write truth table.
(ii) Show the truth table for a half adder. Give the equations for 'sum' and 'carry'. Realize using basic gates. 8

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

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

Make up / Supplementary Examinations – July 2016

15EC112 – BASIC ELECTRONICS

3 Hours

Max. Marks: 100

Note: 1) Answer **Five full** questions choosing **One full** question from **each Unit.**
2) *Missing data if any may be suitably assumed.*

Unit – I

	Marks	BT*
Draw circuit of a diode and a series resistance in forward bias across a DC supply. If diode is silicon, using the piecewise linear approximation, calculate value of current in diode, considering diode dynamic resistance as equal to 5Ω, load resistance being 100Ω and D C supply is **40 volts.**	6	L*4
Show the circuit of a full wave rectifier using two diodes with resistive load and explain operation. Sketch waveforms of input voltage and output voltage. Considering diodes to be ideal, derive expressions for output average D C voltage and output RMS voltage.	10	L3
A full wave rectifier is having a capacitive filter. The load resistance is **50 Ω**, capacitance is **1000 μF** and supply frequency is **50 Hz**. Determine % ripple factor.	4	L2
Sketch forward and reverse V-I characteristics of Germanium diode. Mark cut in voltage, dynamic resistance and reverse breakdown voltage of diode and explain.	6	L2
With circuit diagram, explain operation of half wave diode rectifier with resistive load. Sketch waveforms of input voltage and output current. Derive expressions for average load current and power efficiency considering diode to have conducting resistance equal to **Rf.**	10	L4
Above circuit has AC supply of **110 volts (RMS)** and average load current of **100** milliamperes. Assuming diode to be silicon, calculate value of load resistance.	4	L2

Unit – II

Indicating the current equations for a transistor in a CE stage, clearly bring out the function of a transistor as a current amplifier for a small current signal given at its base terminal.	8	L4
For a NPN transistor in active region, assuming that I_B Vs V_{BE} characteristics are the same as that of a normal silicon diode, and $\beta_{dc} = 80$; calculate the circuit voltage gain when 50mV change in input voltage causes 3μA change in I_B. Given that R_C is equal to 10 kΩ.	6	L4
Draw the typical input and output Characteristics of common emitter NPN transistor stage and indicate different parameters and their ranges.	6	L2

4. a) In the circuit, the silicon transistor has a β of 100. Determine I_B, I_C, V_{CE}.

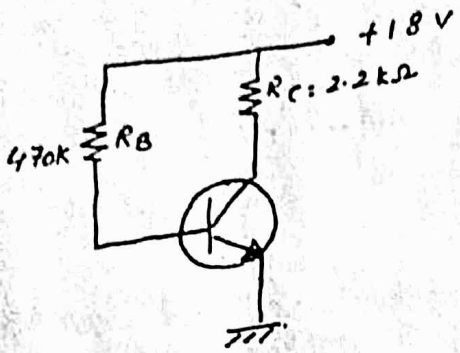

fig 4 a.) 6 L

b) Sketch and explain the forward characteristics of a SCR for different gate circuits. 6 L

c) With circuit of half wave controlled rectifier using SCR, explain pulse triggering circuit. Sketch output waveform with sine wave as input. 8 L

Unit – III

5. a) Draw the circuit of common emitter RC coupled Transistor amplifier and explain the significance of each component. 8 L

b) Draw the circuit of Colpitt's oscillator and explain its operation. Give the expression for frequency of oscillations. 6 L

c) Three amplifiers are working in cascade with 50 mV peak to peak at input providing 150 V peak to peak output. If the absolute voltage gain of the first stage is 20 and the input to third stage is 15 V peak to peak, calculate
   (i) Overall voltage gain in decibel.
   (ii) Voltage gain of each stage in decibel. 6 L

6. a) Draw a circuit of RC phase shift oscillator and explain its operation. Also give the equation for frequency of oscillations. 8 L

b) State and explain Barkhausen criterion for sustained oscillations. 6 L

c) In a transistor Hartley oscillator, L_1 = 5 mH, L_2 = 10 mH and C = 0.01 μF. Calculate
   (i) Frequency of oscillations
   (ii) Feedback factor
   (iii) Gain required for sustained oscillations 6 L

Unit – IV

7. a) With a neat circuit diagram explain how op-amp can be used as a differentiator and derive the expression for output voltage. 6 L

b) Define modulation. Explain amplitude modulation with neat waveforms. 6 L

c) Design an op-amp inverting amplifier biased with ±15 V DC supply. Given R_1=10kΩ, R_2=50kΩ. Calculate the output voltage when the input is (i) 2V (ii) 10V. 8 L

a) Design an op-amp circuit for an output $V_o = -V_1 - V_2 - 5V_3$ 6 L6

b) Compare AM and FM. 6 L4

c) Explain the operation of CRO with neat block diagram. 8 L2

Unit – V

a) Convert the following
i) $(101010111100)_2 = (?)_8 = (?)_{16}$
ii) $(240)_{10} = (?)_2 = (?)_8$ 10 L2

b) Perform subtraction using 2's complement method.
101101-110010 10 L3

a) Realise using basic gates
i) $\bar{x}\bar{y}\bar{z} + x\bar{y}\bar{z} + x\bar{y} + x\bar{y}$
ii) $ABC + AB\bar{C} + \bar{A}BC$ 8 L2

b) Implement EX-OR gate using only Basic gates. 4 L3

c) Design Half-adder circuit using NAND gates. 8 L3

Bloom's Taxonomy, L* Level

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

November - December 2016

16EC112 – BASIC ELECTRONICS

on: 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.

		Marks	BT*
	Unit – I		
a)	Sketch the approximate V-I characteristic of a Germanium diode. A Germanium diode in series with a resistor R is connected in forward bias across dc supply voltage of 9 V. Calculate the value of R for a diode forward current of 2.6 mA.	6	L*4
b)	With the help of circuit diagram and waveforms of input voltage, output current, explain the operation of a full wave rectifier with resistive load which uses two diodes and a center tapped transformer. Also derive the expressions for RMS load current and RMS load voltage considering the diode forward resistance, R_f.	10	L4
c)	A two diode full wave rectifier has a load of 2 KΩ. The ac voltage applied to the diodes is 200-0-200 V (RMS). Assuming ideal diodes, calculate i) Average load current ii) Average load voltage	4	L4
a)	Draw the symbol and reverse V-I characteristics of a Zener diode. Mark important parameters on the characteristic and explain their significance.	6	L3
b)	What is Q-point with reference to diode circuit? Explain the procedure to arrive at the Q-point using dc load line concept for a diode, connected in forward bias across a supply of V volts through a resistor, R. Also draw the dc load line and mark the Q-point for a Silicon diode with R = 100Ω and V = 6 V	10	L3
c)	A Zener diode with V_Z = 9.1 V and I_Z = 20 mA is connected in series with a resistor R, across a dc supply voltage of 30 V. Calculate the value of R. Also calculate the circuit current if supply voltage drops to 27 V.	4	L4
	Unit – II		
a)	Draw the common-emitter configuration circuit for an NPN transistor. Further, sketch and discuss on the input and output characteristics curve.	8	L2
b)	A transistor has common-emitter characteristics with V_{CC}=18 V, R_C=2.2 kΩ and I_B=40 μA. Draw the DC loadline for given specifications.	6	L2
c)	Discuss briefly the forward and reverse characteristics of an SCR with gate terminal open. Use suitable graph in your explanation.	6	L2
a)	Explain all current components of an NPN transistor using neat circuit diagram and give the expression for transistor current I_C, $I_B$and I_E. Compute α and β for the transistor if I_C is 1 mA and I_B is 25 μA.	8	L3
b)	Define the base bias(fixed current bias) with a neat circuit diagram. Express the circuit current equations I_B & I_C and output voltage V_{CE}.	6	L3
c)	Using suitable circuit diagram explain the application of SCR in heater control circuit.	6	L2
	Unit – III		
a)	Sketch frequency response of R – C coupled amplifier. Mark important parameters on the same and explain their significance.	8	L3
b)	Explain with examples how absolute voltage gain and absolute power gain are expressed in dB. If an amplifier has absolute power gain of 100, what will be the gain in dB when absolute power gain reduces to 50?	6	L3

P.T.O.

c) A colpitts oscillator has an output frequency of 100 KHz. Select suitable values for components in the feedback network. 6

6. a) Draw circuit of R – C coupled amplifier and explain function of all components. Sketch waveforms of input signal and amplified output. 8
b) Show circuit of Hartley Oscillator and explain operation. State expression of output frequency. 6
c) In a R – C phase shift oscillator if capacitors are 0.01μF and resistors are 10 KΩ. , determine the output frequency. 6

Unit – IV

7. a) With block diagram explain the communication system. 6
b) Derive the expression for output voltage for Opamp as a differentiator. 8
c) Design an adder circuit using Op-amp to obtain an output voltage given by $V_1 = -[0.5V_1 + 0.8V_2 + 2V_3]$, where V_1, V_2, V_3 are outputs. 6

8. a) Explain the concept of virtual short in an Op-amp. 6
b) Define and explain modulation index of Amplitude Modulation. What is the signification of modulation index? 8
c) Draw the block diagram of CRO and explain the function of each block. 6

Unit – V

9. a) Draw the symbol and truth tables for: (i) OR gate
(ii) AND gate
(iii) INVERTER
(iv) NAND gate 8
b) Implement the following expressions using basic logic gates: 6
(i) $Y = \overline{((A+B)C)}\,D$ (ii) $Y = (A+C)(\bar{B}+D)$
c) (i) Convert $(475.25)_8$ to its decimal equivalent 6
(ii) Subtract $(11010)_2 - (10000)_2$ using 2's complement method

10. a) Convert the following: (i) $(214)_{10} = (?)_8$
(ii) $(3509)_{10} = (?)_H$
(iii) $(2AC5.D)_H = (?)_2$ 6
b) Explain exclusive OR gate with the symbol and truth table. Obtain the expression for the output and implement the exclusive OR gate using basic gates. 6
c) Explain the operation of a Half Adder and implement using basic gates. 8

BT* Bloom's Taxonomy, L* Level

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