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10ELN15/25

# First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014
# Basic Electronics

Time: 3 hrs. Max. Marks:100

**Note:** 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only on OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

## PART – A

1 a. Choose the correct answers for the following : **(04 Marks)**

i) The knee voltage of a silicon diode is
A) 0.3V B) 0.5V C) 0.7V D) None of these

ii) The efficiency of full waves rectifier is about _____ %
A) 40.6 B) 0.46 C) 1.21 D) 81.2

iii) The missing terms in the forward diode current is $I_F = I_o[e^{V/V_T} - 1]$
A) $V_R$ B) $\eta$ C) $V_S$ D) e

iv) The zener diode is mainly used in
A) Comparator B) Regulator C) Multivibrator D) None of these

b. Discuss the behaviour of p-n junctions under: **(06 Marks)**
i) No bias; ii) Forward bias; iii) Reverse bias.

c. Explain the operation of full wave bridge rectifier with neat circuit diagram and waveforms. **(06 Marks)**

d. A zener diode has a breakdown voltage of 10V. It is supplied from a voltage source varying between 20-40V in series with resistance of 820Ω, using an ideal zener diode model obtain minimum and maximum zener currents. **(04 Marks)**

2 a. Choose the correct answers for the following : **(04 Marks)**

i) When transistor operated in cut off and saturation, it acts like
A) a linear amplifier B) a switch
C) a variable capacitor D) a variable resistor

ii) If the base emitter junction is open, what is the collector current
A) 1 mA B) 2mA C) 10mA D) 0

iii) The ____ transistor is used for impedance matching
A) C-B B) C-E C) C-C D) None of these

iv) $\alpha$ of a transistor is 0.99 calculate $\beta$
A) $\beta = 0.9$ B) $\beta = 90$ C) $\beta = 99$ D) $\beta = 0.09$

b. Draw the common emitter circuit and sketch the output characteristics, explain active region, cutoff region and saturation region by indicating them on the characteristic curve. **(08 Marks)**

c. With a neat circuit diagram explain the working of transistor used as voltage amplifier. **(04 Marks)**

d. For a certain transistor, 99.6% of the carriers injected into the base cross the collector-base junction. If the leakage current is 5μA and the collector current is 20mA, calculate: i) The value of $\alpha$; ii) the emitter current. **(04 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**

i) The best biasing stability is achieved by using _____ biasing method.
A) Fixed B) Collector to base
C) Voltage divider D) None of these

ii) In self bias or emitter bias circuit ____ is connected between emitter and ground.
A) Inductor B) Capacitor
C) Resistor D) Zener diode

iii) The stability factor is given by
A) $\frac{dI_{CO}}{dI_E}$ B) $\frac{dI_B}{dI_{CO}}$
C) $\frac{dI_E}{dI_{CO}}$ D) $\frac{dI_C}{dI_{CO}}$

iv) The operating point must be _____ for the proper operation of transistor
A) High B) Stable
C) Increasing D) Decreasing

b. With a neat circuit diagram, explain the working of an collector-to-base bias circuit using an npn transistor and derive the equation for $I_B$. **(06 Marks)**

c. Determine the operating point for a silicon transistor biased by base bias method with $\beta = 100$, $R_B = 500K\Omega$, $R_C = 2.5K\Omega$ and $V_{CC} = 20V$. Also draw the load line. **(06 Marks)**

d. Derive the stability factor S for base bias circuit. **(04 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**

i) With gate open, if the supply voltage exceeds the break over voltage of SCR, then SCR will conduct
A) False B) True
C) Only for D.C D) Only for A.C

ii) The SCR is a ____ device
A) NPN B) PNP
C) PNPN D) PNN

iii) A relaxation oscillator uses ____
A) MOSFET B) SCR
C) UJT D) BJT

iv) FET is a ____ controlled device
A) Voltage B) Current
C) Power D) None of these

b. Explain the construction of n-channel JFET and give its symbol. **(06 Marks)**

c. Write and explain the equivalent circuit of UJT. **(05 Marks)**

d. Explain the two transistor model of SCR. **(05 Marks)**

## PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**

i) Oscillator uses ____ type of feedback
   A) Positive B) Negative
   C) Reverse D) None of these

ii) The total phase shift around a loop must be ____ for the sustained oscillations
   A) 180° B) 360°
   C) 90° D) 270°

iii) The frequency response is a graph of _____
   A) frequency $v_s$ current gain B) frequency $v_s$ voltage gain
   C) frequency $v_s$ output voltage D) frequency $v_s$ input voltage

iv) In RC coupled amplifier the d.c component is blocked by _____
   A) Load resistance $R_L$ B) Coupling capacitor, $C_C$
   C) $R_B$ D) The transistor

b. With a neat circuit diagram, explain the working of a two stage capacitor coupled CE amplifier. **(08 Marks)**

c. Explain with the help of circuit diagram the working of an RC phase shift oscillator using transistor. **(06 Marks)**

d. Find the frequency of the oscillations of transistorized Colpitts oscillator having tank circuit parameters as $C_1$ = 150pF, $C_2$ = 1.5nF and L = 50μH. **(02 Marks)**

6 a. Choose the correct answers for the following : **(04 Marks)**

i) In an inverting amplifier there is _____ phase shift between input and output.
   A) 0° B) 90°
   C) 180° D) 360°

ii) Ideally open loop gain of op-amp is ____
   A) 0 B) 1
   C) ∞ D) Negative

iii) When op-amp used as integrator with input as square wave the output will be ___
   A) Ramp B) Triangular wave
   C) Cosine wave D) Step

iv) Lissajous figures are used to measure ____ difference between sinusoidal signals
   A) Phase B) Amplitude
   C) Frequency D) None of these

b. Write the ideal op-amp characteristics. **(06 Marks)**

c. Show with a circuit diagram how an op-amp can be used as differentiator. **(06 Marks)**

d. Explain how current measurement is done using CRO. **(04 Marks)**

7 a. Choose correct answers for the following : **(04 Marks)**

i) Which of the following is invalid BCD code?

A) 0011 B) 1101

C) 0101 D) 1001

ii) Given the number $(8BF)_{16}$, what is the positional weight of the 8?

A) 16 B) 256

C) 4096 D) 8192

iii) $(64)_{16} - (46)_8$ in binary is

A) 111101101 B) 111101100

C) 111110 D) 1100110

iv) The relation between carrier power and total power in an AM wave _____

A) $P_C = P_T\left(1+\frac{m^2}{4}\right)$ B) $P_C = P_T\left(1+\frac{m^2}{2}\right)$

C) $P_T = P_C\left(1+\frac{m^2}{4}\right)$ D) $P_T = P_C\left(1+\frac{m^2}{2}\right)$

b. Determine the value of base x, if i) $(225)_x = (341)_8$; ii) $(211)_x = (152)_8$. **(06 Marks)**

c. Perform subtraction using 2's complement method 1101 – 1010. **(04 Marks)**

d. Draw the block diagram of super heterodyne receiver and explain the functions of each block. **(06 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**

i) De Morgan's theorem states that $\overline{A+B}$ is

A) $\overline{A}+\overline{B}$ B) $\overline{A}\,\overline{B}$

C) $\overline{AB}$ D) $A+B$

ii) Universal gates are ____ and ____.

A) NOT and NOR B) AND and OR

C) NAND and NOR D) XOR and XNOR

iii) For which gate when the two inputs A and B are equal the output is zero and otherwise one?

A) NAND B) NOR

C) EXNOR D) EXOR

iv) An half adder has two inputs and ____ outputs

A) ONE B) TWO

C) THREE D) None of these

b. Implement EX-NOR gate using only NOR gates. **(04 Marks)**

c. Simplify $AB+\overline{AC}+A\overline{B}C(AB+C)$. **(06 Marks)**

d. Implement full adder using two half adders and one OR gate. Write the equations for sum and $C_{out}$. **(06 Marks)**

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