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10ELN15/25

First/Second Semester B.E. Degree Examination, June/July 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 in OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***

PART – A

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

i) Zener diode can be used for rectification. This statement is _____.
A) true B) false
C) neither true nor false D) none of these

ii) The maximum efficiency of full wave rectifier is _____.
A) 40.6% B) 60.4% C) 78.5% D) 81.2%

iii) The knee voltage of a silicon diode is _____.
A) 0.3V B) 0.5V C) 0.7V D) none of these

iv) If f Hz is the frequency of the input given to a half wave rectifier, the output frequency will be _____.
A) 2f Hz B) f Hz C) 3f Hz D) 0.5f Hz

b. Draw and explain the VI – characteristics of a Si-diode and Ge-diode. **(06 Marks)**

c. With a neat circuit diagram, explain the working principles of full wave bridge rectifier and show that the ripple factor = 0.48, and efficiency = 81.2%. **(10 Marks)**

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

i) The current conduction in BJT is because of _____.
A) electrons B) holes
C) both electrons and holes D) none of these

ii) If $\alpha = 0.95$, then the value of β of transistor is _____.
A) 0.05 B) 19 C) 100 D) 120

iii) Common collector arrangement is generally used for _____.
A) impedance matching B) voltage amplification
C) current amplifier D) none of these

iv) The current relationship between two current gain in a transistor is _____.
A) $\beta = \frac{\alpha}{1-\alpha}$ B) $\beta = \frac{1-\alpha}{1-\alpha}$ C) $\beta = \frac{1-\alpha}{1+\alpha}$ D) $\beta = \frac{1+\beta}{\beta}$

b. Draw input and output characteristics of an NPN transistor in common base configuration and explain. **(10 Marks)**

c. For a Silicon transistor $\alpha_{dc} = 0.995$, emitter current is 10 mA and leakage current I_{co} is 0.5μA. Find I_C, I_B, β and I_{CEO}. **(06 Marks)**

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

i) Which of the following factor affects the Q-point stability?
A) I_{co} B) coupling capacitor
C) emitter resistor D) bypass capacitor

ii) The inter section of the dc load line with given base current curve is the
A) h-point B) D-point C) Q-point D) none of these

iii) For an emitter follower, the voltage gain is _____.
A) unity B) greater than unity C) less than unity D) zero

iv) The best biasing stability is achieved by using _____ biasing method.
A) fixed B) collector to base C) voltage divider D) none of these

b. Explain the working of collector-to-base bias circuit using an NPN transistor and derive the equation for I_B. **(08 Marks)**

c. Define stability factor and discuss the factors that cause instability of biasing circuits. **(08 Marks)**

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

i) FET is a _____ controlled device.
A) voltage B) current C) pulse D) power

ii) PNPN device is an _____.
A) UJT B) SCR C) MOSFET D) MODFET

iii) _____ used as a relaxation oscillator.
A) MOSFET B) SCR C) BJT D) UJT

iv) The intrinsic standoff ratio of UJT _____.
A) equal to one B) must be less than unity
C) must be greater than unity D) must be zero

b. Explain the working of two transistor model of an SCR and obtain the expression for the anode current. **(08 Marks)**

c. Draw the equivalent circuit and VI-characteristic of UJT and explain it. **(08 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) both A and B

ii) The frequency of oscillations in an oscillator is given by _____.
A) $\frac{1}{2\pi LC}$ B) $2\pi LC$ C) $2\pi\sqrt{LC}$ D) $\frac{1}{2\pi\sqrt{LC}}$

iii) With negative feedback, the bandwidth of an amplifier _____.
A) decreases B) increases C) both A and B D) constant

iv) The magnitude voltage gain at half power frequencies of an RC coupled amplifier is _____ times maximum voltage gain.
A) 0.707 B) 7.07 C) 10 D) 17.06

b. Draw the frequency response of an RC-coupled amplifier and explain it. Mention its advantages and disadvantages. **(08 Marks)**

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

d. In a transistor colpitts oscillator having tank circuit parameters as $c_1 = 0.001\ \mu F$ and $c_2 = 0.01\ \mu F$ if $L = 5\mu H$, calculate the frequency of oscillations. **(02 Marks)**

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

i) The gain of the voltage follower is _____.
A) zero B) infinite C) negative D) unity

ii) Ideally open loop gain of op-amp is _____.
A) 0 B) 1 C) ∞ D) positive

iii) The CMRR is given by _____.
A) $A_d \times A_c$ B) A_c / A_d C) A_d / A_c D) none of these

iv) Maximum rate of change of output voltage with time is called _____.
A) CMRR B) slew rate C) over rate D) none of these

b. List the characteristics of an ideal-op-amp and draw the three input inverting summer circuit using an op-amp and derive an expression for output voltage. **(08 Marks)**

c. Draw the basic block diagram of a cathode ray tube and explain its working. **(08 Marks)**

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

i) Two's compliant of $(1001)_2$ is _____
A) 1001 B) 0010 C) 0111 D) 1010

ii) To represent 35 in binary, number of bits required is _____
A) 6 B) 5 C) 4 D) 33

iii) Decimal number 37 is represented in BCD by _____
A) 100111 B) 00111011 C) 00110111 D) 111100

iv) Over modulation exists when modulation index is _____
A) 1 B) 0 C) >1 D) < 1

b. Explain the need for modulation. **(08 Marks)**

c. Convert $(A3B)_{16} = (\quad)_{10}$, and $(247.75)_{10} = (\quad)_2$. **(04 Marks)**

d. i) Perform $(FC02A)_{16} - (D052)_{16}$ using 16's complement.

ii) Subtract $(4317.64)_8$ from $(42.345)_8$ using 8's complement. **(06 Marks)**

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

i) The expression for half adder carry with input A and B is given by _____.
A) A + B B) AB C) $\overline{A}\ \overline{B}$ D) none of these

ii) The complement of A + B + 1 is _____.
A) 0 B) A + 1 C) AB + 1 D) 1

iii) ABCD + ABD is equal to _____.
A) ABC B) $\overline{ABC}$ C) $\overline{ABD}$ D) ABD

iv) A + (B + C) = (A + B) + C is _____ law.
A) associative B) commutative C) distributive D) none of these

b. Design a full adder circuit and realize, using two half adders. **(08 Marks)**

c. Simplify the following expressions and implement using only NAND gates :

i) $Y = ABC + A\overline{B}C + AB\overline{C} + \overline{A}BC$

ii) $Y = \overline{\overline{AB} + \overline{AC}}$

iii) $Y = A + \overline{AB}$. **(08 Marks)**

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