12/12/16

Roll No. | | | | | | | |

H

TEC–101

B. Tech. (First Semester)
End Semester EXAMINATION, 2016
(All Branches)

BASIC ELECTRONICS ENGINEERING

Time : Three Hours] [*Maximum Marks : 100*

Note : (i) This question paper contains five questions.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Total marks assigned to each question are **twenty.**

(v) **Assume** suitable data wherever it is necessary.

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Perform the following conversion :

(i) $(1010101.0101)_2 = (\ )_{16}$

(ii) $(A7F.CD)_{16} = (\ )_2$

(iii) Subtract $(1011)_2 - (1110)_2$ using 2's complement method

(iv) Add 137 + 629 using BCD codes

(b) (i) Prove the consensus law $(A + B)(\bar{A} + C)(B + C) = (A + B)(\bar{A} + C)$.

(ii) Implement the following expression with the help of basic logic gates :

$$F = B(A + CD) + A\bar{C}$$

(c) Which gates are known as universal gate ? Implement AND, OR, NOT, NAND, NOR gates using any *one* of the universal gate only.

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Establish the continuity equation valid for transport of carriers in a semi-conductor.

(b) Write short notes on the following :

(i) Mass Action Law

(ii) Intrinsic and Extrinsic semiconductor

(iii) Conductivity

(iv) Diffusion Current

(c) Explain charge densities in semiconductors. Calculate the density of impurity atoms that must be added to an intrinsic semiconductor crystal to convert it to (a) 10^{-4} ohm-m N-Type Si, (b) 10^{-4} ohm-m P-Type Si. The electron and hole mobilities for Si are 0.138 m^2/V-s and 0.046 m^2/V-s respectively.

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) In a center tap full wave rectifier, the load resistance is 1 kΩ. Each diode has forward resistance of 10 Ω. The voltage across the secondary winding is 220 V. Find the values of the following :

(i) Peak value of current

(ii) Average value of current

(iii) RMS value of current

(iv) Rectification efficiency

(v) Ripple factor

(b) Derive the following parameters for the half wave rectifier :

(i) Average current

(ii) RMS Voltage

(iii) Rectification efficiency

(c) Write short notes on the following :

(i) Zener diode

(ii) LED

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Explain the working and construction of n-channel JFET in detail.

(b) Explain input and output characteristics of CB configuration of npn transistor. Also derive the relation $I_C = \beta I_B + (1+\beta) I_{CBO}$.

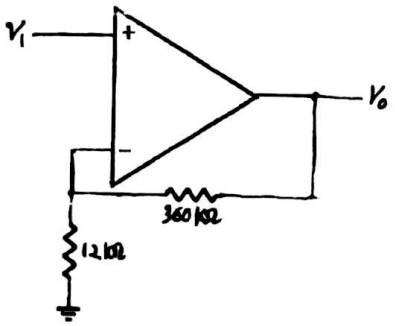
(c) A CE amplifier employing an NPN transistor has load resistance RC connected between collector and V_{cc} supply of + 16V. For biasing a resistor R1 is connected between collector and base. Resistor R_2 = 1 kΩ is connected between base and ground and Resistor RE = 1 kΩ is connected between emitter and ground. Draw the circuit diagram and calculate the value of R_1 and R_C if $V_{CE} = 6\,V$, $V_{BE} = 0.2$ V and $\alpha = 0.985$.

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

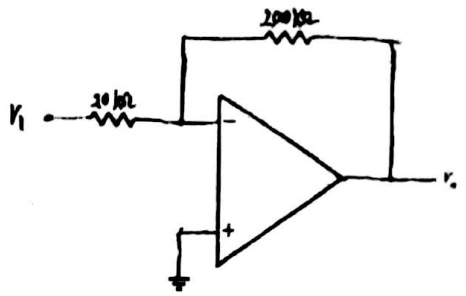
(a) Explain, how an op-amp can be used as a non-inverting amplifier and an as integrator circuit ?

(b) What is the range of output voltage in the following circuits if the input voltage V_I can vary from 0.1 V to 0.4 V ?

(i)



(ii)



(c) Calculate the output voltage (V_o) of the circuit shown in below for $R_f = 68\,k\Omega$.