END SEMESTER EXAMINATION, NOVEMBER-2018

Subject Code : CAI-301

Semester : 3rd

PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

PART – A

Marks – 25

Answer *all* the questions.

1. Fill in the blanks : $1 \times 10 = 10$

   (a) If $e_1 = A$ sin ωt and $e_2 = B$ sin $(\omega t - \phi)$, then $\dfrac{e_2}{e_2}$ _____ e_1 by ϕ.

   (b) In a series R-L circuit, V_L leads V_R by _____ degrees.

   (c) If the resistances $R_1 = 6\Omega$ and $R_2 = 3\Omega$ are connected in series, then the total resistances is _____ .

(d) The process of adding impurities to pure semiconductor is called _____

(e) Any voltage that is connected across a p-n junction is called _____ voltage.

(f) For a silicon diode, the value of the forward bias voltage typically must be greater than _____ V.

(g) Junction breakdown occurs under _____ bias.

(h) A transformer works on _____ only.

(i) A Zener diode is a _____ device.

(j) The NAND gate is AND gate followed by _____ gate.

2. Write true or false : 1×10=10

(a) Semiconductor materials have covalent bonds.

(b) The number of depletion layer in a transistor is one.

(c) When an input signal 1 is applied to a NOT gate, the output is 0.

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(d) According to KCL, in any electrical network, the algebraic sum of the currents meeting at a point (or junction) is zero.

(e) An n-type semiconductor is positively charged.

(f) A semiconductor has generally 4 valence electrons.

(g) A p-n junction acts as a unidirectional switch.

(h) A Zener diode is always forward connected.

(i) The base of a transistor is lightly doped.

(j) Transformers are rated in kW.

3. Choose the correct answer : 1×5=5

(a) The minimum number of wattmeter(s) required to measure 3-phase, 3 wire balanced or unbalanced power is

(i) 1 (ii) 2

(iii) 3 (iv) 4

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(b) Electronic distribution of an Si atom is

(i) 2, 10, 2 (ii) 2, 8, 4

(iii) 2, 7, 5 (iv) 2, 4, 8

(c) Without a DC source, a clipper acts like a

(i) rectifier (ii) clamper

(iii) demodulator (iv) chopper

(d) The following relationship between α and β are correct except

(i) $\beta = \dfrac{\alpha}{1-\alpha}$ (ii) $\alpha = \dfrac{\beta}{1-\beta}$

(iii) $\alpha = \dfrac{\beta}{1+\beta}$ (iv) $1-\alpha = \dfrac{1}{1+\beta}$

(e) The emitter of a transistor is generally doped the heaviest because it

(i) has to dissipate maximum power

(ii) has to supply the charge carriers

(iii) is the first region of the transistor

(iv) must possess low resistance

PART – B

Marks – 45

Answer Q. No. 8 and any *three* from the rest.

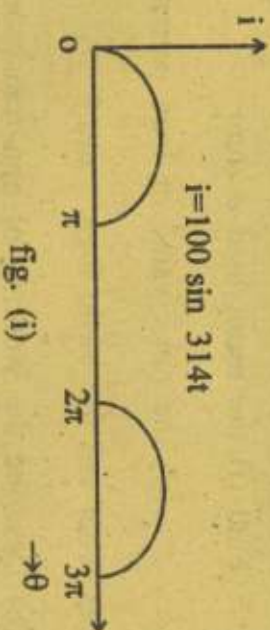4. (a) Define : Form factor, Phase difference. 2

(b) Derive the following relation : 3

$$I = \dfrac{I_m}{\sqrt{2}}$$

where, I is r.m.s value of current

I_m is maximum value of current.

(c) Calculate the form factor and peak factor of the sine wave shown in fig. (i). 5

fig. (i)

$i = 100 \sin 314t$

5. (a) What is the function of transformer ? 2

(b) If the resistances $R_1 = 2\Omega$, $R_2 = 4\Omega$, $R_3 = 6\Omega$ are connected in parallel, then what will be the equivalent resistance ? 3

(c) A transformer takes a current of 0.6A and absorbs 64W when primary is connected to its normal supply of 200V, 50 Hz; the secondary being open-circuit. Find the magnetising and iron loss currents. 5

6. (a) What are p-type and n-type semiconductors? 2

(b) Describe forward and reverse biasing of a p-n junction. 3

(c) A full-wave rectifier uses two diodes, the internal resistance of each diode may be assumed constant at 20Ω. The transformer r.m.s secondary is 50V and load resistance is 980Ω.

Find (i) the mean load current

(ii) the r.m.s value of load current. 5

7. (a) What are the basic logic gates? 2

(b) Describe the working of npn transistor. 3

(c) In a common base connection, current amplification factor is 0.9. If the emitter current is 1 mA, determine the value of base current. 5

8. Write short notes on any *three* :   5×3=15

(a) R-L-C series circuit

(b) Relation between line current and phase currents in delta connected 3-phase system

(c) Zener diode as voltage stabiliser

(d) Centre-tap full-wave rectifier

(e) Power measurement by two wattmeter method.