DipIETE – ET (OLD SCHEME)

Code: DE06
Time: 3 Hours

JUNE 2011

Subject: BASIC ELECTRONICS
Max. Marks: 100

NOTE: There are 9 Questions in all.
- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 **Choose the correct or the best alternative in the following:** (2×10)

    a. Colour coding of 10KΩ resistance with 5% tolerance is _____

      (A) Black Brown Red Silver.   **(B)** Black Black Red Silver
      (C) Brown Black Orange Gold   **(D)** Black Red Orange Gold

    b. For insulators, the forbidden gap is of the order of _____

      (A) 5eV   **(B)** 1eV
      (C) 0.1eV   **(D)** zero

    c. The number of minority carriers crossing the junctions of a PN junctions diode depends primarily on _____

      (A) concentration of doping impurities.
      (B) magnitude of potential barrier.
      (C) magnitude of forward bias voltage.
      (D) rate of thermal generation of electron hole pairs.

    d. In a PN junction the avalanche breakdown voltage with semiconductor resistivity _____

      (A) decreases
      (B) increases
      (C) both the parameters are independent
      (D) decreases or increases in abrupt PN junction

    e The correct relation between β and α is _____

      (A) $\beta = \dfrac{\alpha}{1+\alpha}$ **(B)** $\beta = \dfrac{1+\alpha}{\alpha}$

      (C) $\beta = \dfrac{\alpha}{1-\alpha}$ **(D)** $\alpha = 1+\beta$

f. In an FET, the drain voltage above which there is no increase in the drain current is known as _____

    (A) breakdown voltage   **(B)** pinch off voltage
    (C) critical voltage   **(D)** threshold voltage

g. When cathode of a thyristor is made more positive than its anode _____

    (A) all the junctions are reverse biased.
    (B) outer junctions are reverse biased and central one is forward biased.
    (C) outer junctions are forward biased and central one is reverse biased.
    (D) all the junctions are forward biased.

h. An UJT has _____

    (A) stable negative resistance characteristics.
    (B) low firing current.
    (C) use as a waveform generator.
    (D) all of the above characteristics.

i. A differential amplifier has a differential gain of 2000 and a common mode gain of 0.2. The CMRR in dB is equal to _____

    (A) 10^4 **(B)** 400
    (C) 80   **(D)** 40

j. The most significant factor in the relative manufacturing cost of IC components is _____

    (A) the shape of the component.
    (B) number of electrode connections.
    (C) the area occupied by the component.
    (D) the position of the component on the slice.

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2   a. What are the various types of capacitors and discuss their important specifications.   **(8)**

       b. Differentiate between an ideal and practical voltage source. Give their graphical representations and convert 10 V voltage source with its series resistance of 2Ω into its equivalent current source.   **(3+3+2)**

Q.3   a. Explain the working of a shunt capacitor filter and derive an approximate expression for ripple factor in half wave rectifier with shunt capacitor filter.   **(4+4)**

       b. Explain the following terms:
         (i) dynamic resistance   (ii) static resistance
         (iii) diffusion capacitance   (iv) transition capacitance   **(2×4)**

Q.4 a. Draw the V-I characteristics of Tunnel diode and briefly describe the mechanism of junction breakdown. **(8)**

      b. A half wave rectifier having a diode of forward resistance 1KΩ and a load resistance of 1KΩ rectifies an AC voltage of 310V peak value then calculate
         (i) Average current.   (ii) RMS value of current.
         (iii) DC output power.   (iv) Rectifier efficiency. **(2×4)**

Q.5 a. Compare the differences between JFET and MOSFET and also prove that the transconductance g_m of a JFET is given by

$$g_m = \frac{2}{|V_p|}\sqrt{I_{DS}I_{DSS}}$$ **(10)**

      b. Explain the UJT as a relaxation oscillator. **(6)**

Q.6 a. Distinguish between intrinsic and extrinsic semiconductor. What is the effect of temperature on the conductivity of a semiconductor? **(5+5)**

      b. A silicon diode has reverse saturation current of 2.5µA at $300°K$. Find forward voltage for a forward current of 10mA. **(6)**

Q.7 a. Sketch and explain the shape of the output characteristics of a BJT in CE configuration by showing the various regions of operations on the curves. **(8)**

      b. What do you understand by transistor biasing and explain how stability can be achieved in a self bias transistor circuit. **(8)**

Q.8 a. What is photoelectric emission? How is the electron emission affected if (i) the frequency and (ii) the intensity of the incident radiations are increased. **(8)**

      b. Draw the circuit diagram of unity gain amplifier using Op-Amp and give its application. **(4)**

      c. Write a short note on IC packaging methods. **(4)**

Q. 9.   Discuss any of the following **TWO** applications of Op-Amp: **(8×2)**

         (i)   Inverting amplifier and non inverting amplifier.
         (ii)   Integrator and differentiator.
         (iii)   Voltage to current converter or current to voltage converter.