Registration No. :

Total number of printed pages – 4

Second Semester (Back) Examination – 2013
BASIC ELECTRONICS
BRANCH : ALL
QUESTION CODE : B477
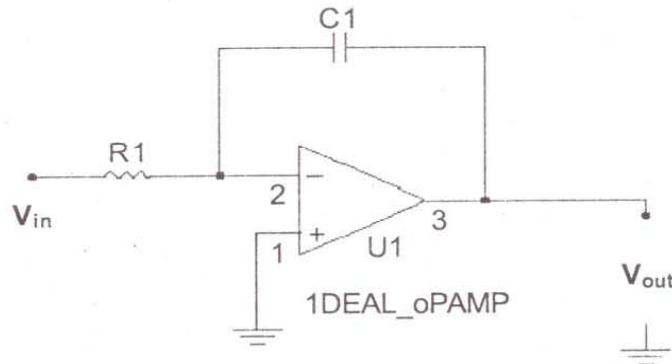#### Full Marks – 70
Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2 ×10

    (a) Why the resistance of semiconductor material decreases with increases in temperature ?

    (b) Draw the output waveform the following circuit if an unit step signal is applied at input :

    (c) Add two numbers (−7, +18) in 2′ complement notation

    (d) If a non-inverting amplifier has an input resistance (R_{IN}) of 1000 ohms and an feedback resistance (R_{FB}) of 2.5 kilo ohms, what is the output voltage when 1.42 mV is applied to the correct input ?

   (e) Name the various logic states in an S-R flip-flop.

(f)   In a CE transistor amplifier base current is 0.01 mA and emitter current is 1 mA. Calculate the current amplification factor α and β of the transistor.

(g)   If the overall bandwidth of three identical voltage amplifier stages connected in cascade is 1000. Find bandwidth of each stage in dB.

(h)   Realize an equality detector using logic gate which gives output Y = 1, if both the inputs of the combinational circuits are same and zero for other conditions.

(i)   A waveform occupies six divisions of an oscilloscope screen when the time base is switched off. The voltage gain is set to 0.25 V/div. Calculate the rms current being tested if the resistance of the circuit is known to be 19 ohm.

(j)   Under what conditions a diode circuit act as a clipper ?

2.   (a)   Derive the expression for the closed loop voltage gain of a – ve feedback amplifier if the open loop gain is A and feedback ratio is B. Draw the necessary diagram.   5

(b)   Find out the voltage gain of circuit shown below :   5
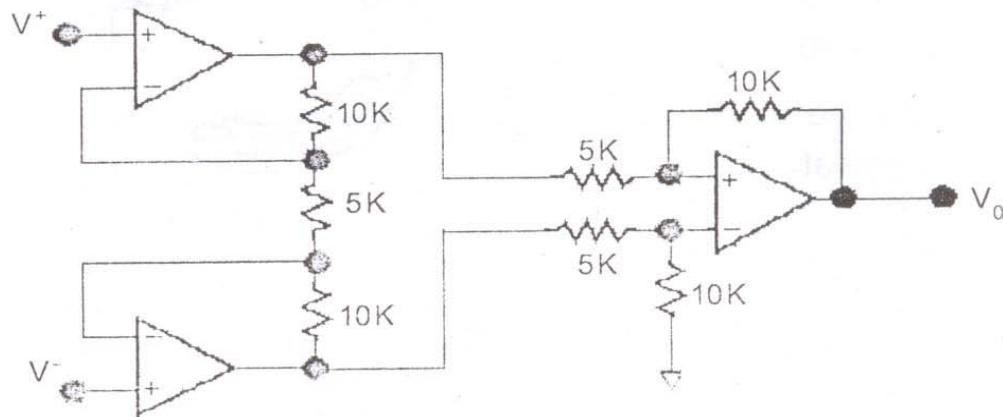
3.   (a)   With a neat block diagram explain the operation of cathode ray tube (CRT).   5

(b)   Explain the ideal characteristics of an electronics instrument.   5

4.   The transistor biasing circuit is shown below. Find

(i) V_{CE}, V_B and V_E 3

(ii) β_{dc} 2

(iii) Draw the load line of the circuit.   3

(iv) I_C, I_B 2
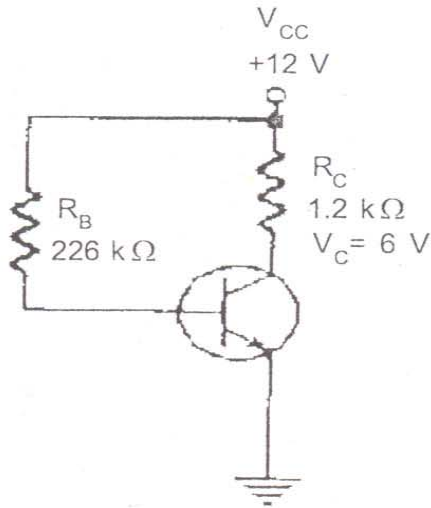
5. (a) Explain the principle of an sinusoidal oscillator.   5

    (b) What are the basic requirements for oscillation in an oscillator ? Also
         explain the physical significance of Barkhausen criteria.   5

6. (a) Simplify the following function using Boolean algebra identity :

         $F(A, B, C, D) = \Sigma_m (4, 5, 6, 7, 12, 13, 14)$.

         And then, write the simplified functions in SOP form.   5

    (b) Implement the following function using NOR gate only :   5

         $F(\dot{A}, B, C, D) = (A + C)(B + \overline{C}\overline{D})$.

7. A half-wave rectifier is to provide an average voltage of 50 V at its output. Find :
                                                                             10

    (a) Draw a schematic diagram of the circuit with specification and value of the
         components used.

    (b) Sketch the output voltage wave shape showing value at each node.

    (c) Determine the peak value of the input voltage.

    (d) Sketch the input voltage wave shape.

    (e) The rms voltage at the input.

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8.   Write short notes on any **two** :   5×2

    (a) Frequency response of the amplifier

    (b) Diode clamper circuits

    (c) Full adder circuits

    (d) Semiconductor memory.

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