Printed Pages : 7 **EEC-309**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0321 Roll No. | | | | | | | | | | |

B. Tech.

(Semester-III) Theory Examination, 2011-12

ANALOG & DIGITAL ELECTRONICS

Time : 3 Hours] *[Total Marks : 100*

Note: Attempt questions from each Section as per directions.

Section-A

1. Attempt *all* parts of this question : 2×10=20

(a) What is backward diode ?

(b) What is tunnel effect in a Tunnel Diode ?

(c) What do you mean by Mid frequency range related to an amplifier ?

(d) What are the different types of –ve feedback ?

(e) What is the Barkhausen condition under which a feedback amplifier works as an oscillator ?

(f) Give four advantages of Colpitt's oscillator over other oscillators.

(g) Write difference between combinational and sequential circuits.

(h) Write counting sequence of Mod 6 binary counter.

(i) What is the difference between Astable, Monostable, and Bistable multivibrator ?

(j) How operation amplifier is different from an ordinary transistor amplifier ?

Section-B

2. Attempt any *three* parts of this question : 10×3=30

(a) (i) Explain the principle of operation of an LED. Why is silicon not preferred as an LED material ?

(ii) Draw VI characteristic of tunnel diode.

(b) Draw the circuit diagram of an astable multivibrator and explain its priciple of action, showing the collector voltage waveforms.

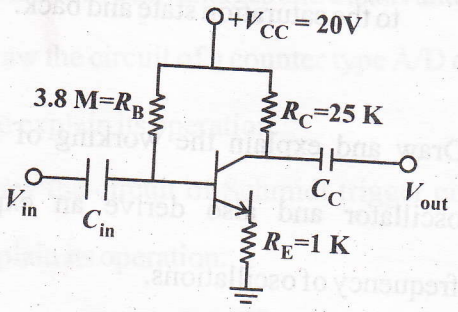
(c) (i) A Wien-bridge oscillator has a frequency of 1056 Hz and capacitance of 100 pF. Find the resistance. If the amplifier gain is 16, obtain the ratio of the resistance in the other arms.

(ii) Discuss the principle of operation of a crystal oscillator.

(d) Draw the circuit of an S-R flip-flop using NAND gates. Modify it to include clock. Derive J-K circuit from S-R flip-flop circuit and explain its truth table.

(e) (i) Show that negative feedback improves the stability of the gain of an amplifier.

(ii) Find feedback ratio, feedback factor and voltage gain with feedback for the circuit shown below. Assume transistor β=200 and neglect V_{be}.



Section–C

Attempt *all* questions of this Section : 10×5=50

3. Attempt any *two* parts :

(a) Explain with characteristic the operation of Varactor diode.

(b) A transistor used as a switch has its emitter current increased from 15 to 20 mA. This caused the reading of an ammeter in base lead to increase from 0.32 mA to 0.48 mA. Calculate (i) h_{fb} and (ii) h_{fe}.

(c) Explain the various switching times when a transistor makes transition from the cut-off state to the saturation state and back.

4. Draw and explain the working of R-C phase shift oscillator and also derive an expression for its frequency of oscillations.

Or

In a Colpitt's oscillator, inductor L has a small series resistance. Find the expression for frequency of oscillation.

If component values are selected as L=100mH, C_1=10pF, C_2=100PF, $r = 50\,\Omega$, R_0=2.2 kΩ, calculate :

(a) Frequency of oscillation

(b) Minimum gain required for oscillation.

5. Attempt any *two* parts :

(a) What are the various types of ROM's ? Discuss their relative advantages and disadvantages.

(b) Draw the circuit of a counter type A/D converter and explain its operation.

(c) Draw the circuit of Schmidt trigger circuit and explain its operation.

6. Attempt any *two* parts :

(a) (i) A shift register has 12 flip-flops. What is the largest decimal number and hexadecimal number that can be stored in it ?

(ii) Determine the number of flip-flops that would be required to design Mod 22, Mod 31 and Mod 67 counters.

(b) What is shift register ? Explain the operation of 4-bit shift register.

(c) What is demultiplexer ? How can a decoder circuit be used as a demultiplexer ? Give block diagram of a 4 to 16 line demultiplexer.

7. Draw the low frequency small signal model of a transistor in CB and CE configurations and explain significance of each model.

Or

The amplifier circuit shown in following figure uses a transistor with h_{fe}=100, h_{ie}=3.37 K. Calculate A_1, A_v, R_1.