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EEC-309

B. Tech.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

ANALOG AND DIGITAL ELECTRONICS

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

Note :   (1)   Attempt ALL questions.

(2)   All question carry equal marks.

(3)   Assume any relevant data, if necessary.

1.   Attempt any **four** of the following :   **(5×4=20)**

a)   What is backward diode ? What is tunnel effect in a tunnel diode ?

b)   Draw the energy band diagram & VI characteristics of Schottky diode.

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

d)   Explain the working of varactor diode. Why is it sometimes called the voltage variable capacitance ?

e)   With the help of suitable circuit diagram, show that a transistor can be used as a switch.

f)   Which diode is called majority carrier device ? Draw and explain its layout and V-i characteristics.

2 Attempt any **four** of the following : (5×4=20)

a) An amplifier has a midband gain of 1500 and a bandwidth of 4 MHz, the miband gain reduces to 150 when a negative feedback is applied. Determine the value of feedback factor and bandwidth.

b) Draw the block diagram of negative feedback arrangements. Derive an expression for gain with negative feedback.

c) Calculate the voltage gain, input and output resistances of a voltage series feedback amplifier having $A_v=300$, $R_i=1.5k\Omega$, $R_o=50k\Omega$ and $\beta=1/15$.

d) Draw the high frequency equivalent circuit for the typical RC coupled common emitter amplifier and derive the expression for cut off frequencies.

e) Draw the circuit diagram of series shunt feedback amplifier and explain the working operation.

f) Identify the feedback topology of the amplifier circuit shown in following figure.1 uses a transistor with $h_{fe}=100$, $h_{ie}=3.37$ K.calculate A_i, A_v, R_i, R_o, R_{of}.
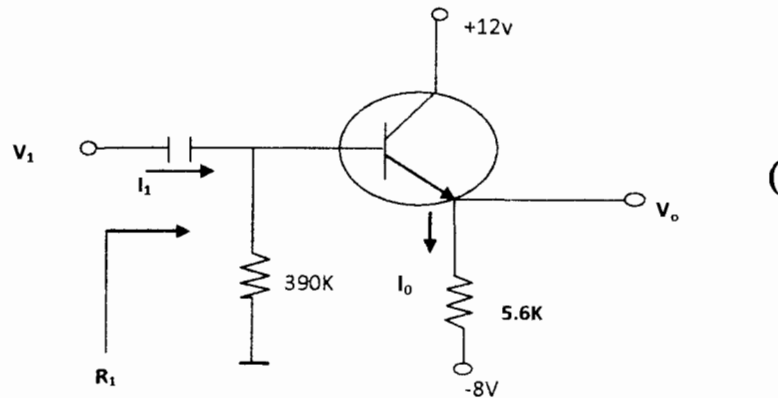

Fig.1.

3 Attempt any **two** of the following : (10×2=20)

a) What is barkhausen criterion for the feedback oscillator ? Draw a neat diagram of a phase shift oscillator using op-amp. Derive an expression for its frequency of oscillation.

b) Explain the working of Wein –bridge oscillator. Derive the formula for the frequency of oscillation.

c) A Hartley oscillator has $L_1=1000\mu H$, $L_2=100\mu H$ and the capacitance is variable. Determine the range of inductance values, if the frequency of oscillation is to vary between 950kHz and 2050kHz.

4 Attempt any **two** of the following : (10×2=20)

a) (i) Realize the function using 8:1 MUX for the given function $f(A,B,C,D)=\sum m(0,2,6,8,9,10,11,14)$ with variable A is connected from input line and B,C,D connected from selection line.

(ii) What is decoder ? Draw the circuit diagram of 3:8 decoder and explain the operation.

b) Design a binary counter using J-K flip flops having the following repeated sequences: 2,1 4,7,5,3. Is counter suffers from lock out problem, if yes, draw state diagram of invalid states.

c) What is shift register ? Draw diagram of a 4-bit binary ripple up counter using flip flop that trigger on positive edge transition.

5 Attempt any **two** of the following : (10×2=20)

a) Draw the circuit of a shunt voltage regulator. Explain the working operation. What are the advantages of adjustable voltage regulator over the fix voltage regulator ?

b) Describe the working of 555 timer. How it works as monostable multivibrator also draw the capacitor and output voltage waveform ?

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

(ii) The memory unit has a capacity of 8192 words of 32 bits per words. How many flip flop are needed for memory address register and memory buffer register. How many word will the memory unit contain if the address register has 15 bits.