SE - Sem - IV - Electrical - ECD 27/5/15

(OLD COURSE) **QP Code : 4003**

Duration: 3 hours **Max marks: 100**

N.B.:

1. **Q 1 is compulsory**
2. Answer **any four** out of remaining **six** questions
3. Assumptions made should be clearly stated
4. Assume any suitable data wherever required but justify the same
5. Figures to the right indicate marks

Q.1 Answer the following

(A) Define the following parameters of op-amp and explain the importance of them following while designing various application circuits. (05)

(i) Gain Bandwidth product (ii) Slew rate (iii) CMRR (iv) PSRR

(B) Explain the operation Colpitts oscillator with the help of suitable diagram. State the condition for sustained oscillations and the frequency of oscillations. (07)

(C) What is the impact of cascading a CC stage at the input of a CE amplifier? (05)

Q.2 (A)Design a single stage CE amplifier using BC147B transistor, with following specifications: (14)

Voltage gain (A_v) = 100 Supply Voltage (V_{cc}) = 15 volts

Overall stability factor (S) <= 10 Lower cutoff freq. (f_{low}) = 20Hz

The specifications of BC147B are as given below:

$h_{FE\,typ}$ = 290 $h_{fe\,typ}$ = 330 $h_{fe\,min}$ = 240 $h_{fe(max)}$ = 500

h_{ie} = 4.5 kohm h_{oe} = 30 micromho h_{re} = 2×10^{-4}

(B) If two amplifiers with same specifications as designed in part (A) are cascaded, then Calculate (i) gain of the first stage (ii) overall gain of two stages provided the load of second stage is 10 kohm. (iii) lower cutoff frequency of the cascaded amplfier. (06)

Q.3 (A) Design a class A transformer coupled amplifier with output power of 5 watts, load resistance of 4 ohms. Assume transformer efficiency of 80% and supply voltage of 12 volts. Use the transistor with following specifications (12)

P_{Dmax} (at 25°C)= 30 W, V_{CEO} = 40 Volts, I_{Cmax} (at 25°C) = 5Amps, V_{CEsat} = 1Volt

(B) Compare the RC oscillators with LC oscillators. Describe the operating principle of in short a Wien Bridge oscillator with the help of suitable schematic. (10)

Q.4 (A) What are active filters? Explain the classifications of active filters with their frequency response curve. Design a first order low pass filter for a cutoff frequency of 1.0 kHz and pass-band gain of 6. (10)

(B) Describe the following application of op-amp in short. **(Any Two)** (10)

(i) Sample and hold circuit (ii) Adder (iii) Schmitt trigger

Q.5 (A) With the help of a neat circuit diagram, explain the working of a gyrator circuit. (10)

(B) Draw the neat diagram of an UJT relaxation oscillator. Explain its operation. Derive the expression for frequency of output signal. Draw various waveforms. (10)

Q.6 (A) What is a Darlington pair? What are its features? Derive the expression for voltage and current gain of the Darlington pair emitter follower circuit? (10)

(B) What are the different types of coupling used in JFET amplifiers? Draw the frequency response of JFET amplifiers and explain why the gain is dropping at low and high frequencies. (10)

Q.7 Write short notes on **any three** (20)

(i) Precision Rectifier
(ii) I-V converter
(iii) Comparison of class A and class B power amplifiers
(iv) Op-amp - clipper and clamper applications
