

C.U.SHAH UNIVERSITY

Winter Examination-2015

Subject Name: Analog Electronics Circuits

Subject Code: 4TE03AEC1

Branch: B.Tech (EE,EEE,IC)

Semester: 3 Date: 03/12/2015 Time: 2:30 To 5:30 Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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Q-1

Attempt the following questions:

(14)

- a) In a full wave rectifier circuit with centre tap transformer, if peak voltage between one end of secondary winding and centre tap is 150 V, then peak inverse voltage (PIV) is _____
(I) 300 V (II) 75 V (III) 150 V (IV) 212 V
- b) In a full wave bridge rectifier circuit, diode resistance $R_f = 100 \Omega$, secondary winding resistance $R_s = 30 \Omega$ and load resistance $R_L = 10 k\Omega$. What will be the percentage voltage regulation for the rectifier?
(I) 1.3 % (II) 2.3 % (III) 0.1 % (IV) 3.3 %
- c) Which power amplifier provides output signal for only 180° or one half of the input signal cycle?
(I) Class AB (II) Class A (III) Class C (IV) Class B
- d) What will be the effective load resistance at the primary side of 15:1 transformer connected to an 8Ω load?
(I) $3.6 k\Omega$ (II) $1.8 k\Omega$ (III) 960Ω (IV) 225Ω
- e) For a common emitter hybrid-pi model, value of internal base to collector capacitance $C_{b'c} = 4 pF$, internal base to emitter capacitance $C_{b'e} = 27 pF$ and internal base to emitter resistance $r_{b'e} = 860 \Omega$. What will be short circuit small signal forward current transfer ratio f_β ?



- (I) 46.28 MHz (II) 5.97 MHz (III) 185 MHz (IV) 26 MHz
- f) For a common emitter amplifier, if A_V is voltage gain and A_i is current gain, which one is the correct option?
- (I) $A_V > 1, A_i < 1$ (II) $A_V < 1, A_i < 1$
 (III) $A_V < 1, A_i > 1$ (IV) $A_V > 1, A_i > 1$
- g) An amplifier has bandwidth without feedback $BW = 40 \text{ kHz}$ and a gain of 50. If 5% of negative feedback is provided, what will be the bandwidth with feedback?
- (I) 11 kHz (II) 140 kHz (III) 40 kHz (IV) 60 kHz
- h) Which one of this BJT biasing circuit is β (h_{fe}) independent?
- (I) Voltage Divider Bias (II) Fixed Bias
 (III) Collector to Base Bias (IV) Both (I) and (III)
- i) What will be the size of emitter bypass capacitor for CE amplifier to provide a low frequency 3 dB point at 250 Hz, when emitter resistance $R_e = 1 \text{ k}\Omega$, $h_{fe} = 50$, $h_{ie} = 1 \text{ k}\Omega$, source resistance $R_s = 600 \Omega$?
- (I) 47 μF (II) 10 μF (III) 20 μF (IV) 50 μF
- j) For a sinusoidal oscillator circuit, what is the Barkhausen criteria for oscillator circuit?
- (I) $\beta A < 1$ (II) $\beta A = 1$ (III) $\beta A = -1$ (IV) $\beta A = 0$
- k) In a Hartley's oscillator circuit $L_1 = 1 \text{ mH}$, $L_2 = 100 \mu\text{H}$, $M = 50 \mu\text{H}$ and $C = 100 \text{ pF}$. What will be the frequency of oscillation?
- (I) 503 kHz (II) 1.15 MHz (III) 459 kHz (IV) 13 kHz
- l) An input voltage $v_{in} = 20 \text{ mV}$ is applied at inverting terminal of the op-amp having open loop gain 200,000. What will be the output voltage?
- (I) -4000 V (II) 4000 V (III) 10,000 V (IV) -10,000 V
- m) For an ideal operational amplifier which one is the false statement?
- (I) Infinite input resistance (II) Zero output resistance
 (III) Infinite Voltage Gain (IV) Zero input resistance
- n) If I_{B1} and I_{B2} are the base bias current of op-amp, then what will be the input offset current I_{io} of op-amp?
- (I) $\frac{I_{B1} + I_{B2}}{2}$ (II) $|I_{B1} - I_{B2}|$ (III) $|I_{B1} + I_{B2}|$ (IV) $\frac{I_{B1} - I_{B2}}{I_{B1} + I_{B2}}$



Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions (14)

- (a) Draw the circuit diagram of full wave bridge wave rectifier with capacitor filter and explain its operation. Draw the waveforms of supply voltage, load voltage, load current and capacitor current. **07**
- (b) Calculate the range of input voltage of zener shunt regulator for which output voltage will remain constant. Zener regulator circuit has following specifications: **07**
- Output Voltage $V_o = 5 V$ Series Resistance $R_s = 1.5 k\Omega$
Load Resistance $R_L = 2.2 k\Omega$ Zener Minimum Current = $1 mA$
Zener Maximum Current = $20 mA$

Q-3 Attempt all questions (14)

- (a) A full wave bridge rectifier is operated from $230 V (rms)$ with $50 Hz$ supply. It is connected to a load resistance of 470Ω and $470 \mu F$ filter capacitor. Calculate **07**
- (i) Average DC load voltage
(ii) Peak to peak ripple voltage and Peak ripple voltage
(iii) Minimum value of load voltage
(iv) Ripple Factor
- (b) Explain collector to base bias circuit for BJT. **07**

Q-4 Attempt all questions (14)

- (a) Draw low frequency model (h-parameter model) for common emitter amplifier and explain the effect of emitter bypass capacitor on amplifier voltage gain by deriving the equation $\left| \frac{A_{v(LF)}}{A_{v(MF)}} \right| = \frac{1}{\sqrt{2}}$. Where, $A_{v(LF)}$ = Low frequency voltage gain and $A_{v(MF)}$ = Mid frequency voltage gain. **07**
- (b) Draw circuit diagram of Class B push pull amplifier and explain its operation. Show the output voltage and current swing in the transistor characteristics. **07**



- Q-5 Attempt all questions (14)**
- (a) A transistor is used in a CE amplifier at a quiescent collector current of 1 mA. If the load resistance (collector resistance) is $6.8\text{ k}\Omega$ and the source resistance is considered to be negligible. The h parameters value for given transistor are $h_{ie} = 6400\ \Omega$, $h_{fe} = 240$ and $h_{re} = 1.5 \times 10^{-4}$, $\frac{1}{h_{oe}} = 166\text{ k}\Omega$. Calculate the following parameters. **07**
- (i) Current Gain (iii) Voltage Gain
(ii) Input resistance (iv) Power Gain
- (b) Draw the Hybrid-pi model of common emitter amplifier and derive the equation for short circuit current gain. **07**
- Q-6 Attempt all questions (14)**
- (a) Draw the circuit diagram of Wein Bridge oscillator circuit and obtain the condition $f = \frac{1}{2\pi RC}$ for sustained oscillation. **07**
- (b) Calculate the following parameters for a current series feedback amplifier having open loop gain $A = 300$, input resistance without feedback $R_i = 1.5\text{ k}\Omega$, output resistance without feedback $R_o = 50\text{ k}\Omega$ and feedback factor $\beta = 10\%$. Calculate **07**
- (i) Gain (ii) Input Resistance (iii) Output Resistance
- Q-7 Attempt all questions (14)**
- (a) A three section RC phase shift oscillator has $R = 10\text{ k}\Omega$ and $C = 0.01\ \mu\text{F}$. **07**
- (i) What is the frequency of oscillation?
(ii) If the oscillator is to be made variable of using the same value of R , what should be the tuning range of capacitor to obtain a frequency range from 1 kHz to 100 kHz ?
- (b) Draw the block diagram of feedback amplifier and explain function of each block. **07**
- Q-8 Attempt all questions (14)**
- (a) Explain the operation of Astable multivibrator with necessary waveforms. **07**
- (b) Explain the following modes of operational amplifier for open loop configuration. **07**
- (i) Differential Amplifier (ii) Inverting Amplifier (iii) Non-inverting Amplifier



