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COURSE BEE303

Fifth Semester B.E. / B. Arch. / MCA / M.Tech. Semester End Examination, MAR/APR. 2023-24

ANALOG ELECTRONIC CIRCUITS (Model Question Paper)

Time: 3 Hours **Max. Marks: 100**

Instructions: ***1.*** ***Answer any Five full questions choosing ONE from each unit.***

		UNIT - I	L	CO	PO	M
1	a.	Explain the working of negative clamper circuit. Draw the required waveforms				
			(2)	**(1)**	**(1)**	**(5)**
	b.	Design a fixed bias circuit for the following specifications: $V_{CC=}\ \ 12V, I_C = 3mA, V_{CE=}6V, \beta = 100$				
			(2)	**(1)**	**(1)**	**(5)**
	c.	For the voltage divider bias circuit, derive an expression for stability factor S_{Ic0} and explain the variation of S_{Ic0} for different cases.				
			(3)	**(1)**	**(2)**	**(10)**
2	a.	Explain the working of series clipping circuit to clip the input sinusoidal signal above reference level. Draw the waveforms and transfer characteristics.				
			(1)	**(1)**	**(1)**	**(5)**
	b.	For the emitter stabilized bias circuit, calculate the location of operating point Q and the voltages $V_B, V_C\ , V_{BC}$ if $R_C = 3.3k\Omega, R_B = 220k\Omega, R_E = 1k\Omega, V_{CC} = 10V, \beta = 150.$				
			(3)	**(1)**	**(2)**	**(5)**
	c.	For the fixed bias circuit, derive an expression for stability factors $S_{Ico,}\ \ S_{VBE}, S_\beta$ and also obtain the relation between (i) $S_{Ico,}\ \ and\ \ S_{VBE}$, (ii) $S_{Ico,}\ \ and\ S_\beta.$				
			(3)	**(1)**	**(2)**	**(10)**
		UNIT – II	**L**	**CO**	**PO**	**M**
3	a.	Draw the hybrid parameter model for common base and common emitter modes along with the suitable equations.				
			(3)	**(2)**	**(1)**	**(6)**
	b.	For the common collector amplifier, calculate current gain, input resistance, voltage gain and output impedance if $V_{CC} = 10V, R_1 = 6k\Omega, R_2 = 6k\Omega, R_S = 600\Omega, R_E = 1k\Omega, R_\mathrm{L} = 10\mathrm{k}\Omega$. h-parameters are $h_{oc} = \frac{25\mu A}{V}, h_{rc} = 1, h_{fc} = -101, h_{ic} = 1.2k\Omega$. Use exact *h-parameter* model.				
			(3)	**(2)**	**(2)**	**(10)**
	c.	Compare common base, common collector and common emitter modes.				
			(1)	**(2)**	**(1)**	**(4)**
4	a.	Explain the effect of input RC network, output RC network and bypass network on the low frequency response of RC coupled amplifier.				
			(3)	**(2)**	**(1)**	**(10)**
	b.	Using *hybrid pi* model, derive an expression for common emitter short circuit current gain and its variation on frequency. Also obtain expressions for $f_\beta\ \ and\ f_T.$				
			(4)	**(2)**	**(2)**	**(10)**
		UNIT - III	**L**	**CO**	**PO**	**M**
5	a.	For the Darlington connection, derive an expression for current gain and input resistance for first and second stage. Also calculate overall current gain.				
			(3)	**(3)**	**(1)**	**(10)**
	b.	For the two stage CE-CE , RC coupled amplifier, $R_1 = 220k\Omega, R_2 = 22k\Omega, R_C = 3.3k\Omega.\ R_E = 470\Omega,\ \ R_S = 600\Omega\ , C_E = 47\mu F, C_1 = C_2 = 0.1\mu F\ for\ the\ first\ stage.$ For the second stage the component values are $R_1' = 33k\Omega, R_2' = 3.3k\Omega, R_C' = 4.7k\Omega, R_E' = 330\Omega, C_E' = 10\mu F, V_{CC} = 10V, h_{ie} = 1.2k\Omega, h_{fe} = 50$. Calculate the overall voltage gain taking source				

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

		resistance into account, input resistance and output resistance. Draw the circuit diagram and use approximate hybrid model.				
			(4)	**(3)**	**(2)**	**(10)**
6	a.	Explain the features of following feedback amplifiers: (i)Voltage series feedback amplifiers (ii)Current shunt feedback amplifiers				
			(2)	**(3)**	**(1)**	**(10)**
	b.	For the current series feedback amplifier, obtain an expression for input resistance with feedback and output resistance with feedback.				
			(2)	**(3)**	**(1)**	**(10)**
		UNIT - IV	**L**	**CO**	**PO**	**M**
7	a.	Define total harmonic distortion in power amplifiers. Hence derive an expression for second harmonic distortion in Class-A power amplifier.				
			(2)	**(4)**	**(1)**	**(10)**
	b.	Compare push-pull and complementary symmetry Class B power amplifiers.				
			(1)	**(4)**	**(1)**	**(5)**
	c.	In class B push-pull amplifier, show that efficiency at maximum power dissipation is only 50 %.				
			(2)	**(4)**	**(1)**	**(5)**
8	a.	Explain Barkhausen criteria for sustained oscillations.				
			(2)	**(4)**	**(1)**	**(5)**
	b.	For Wien bridge oscillator, derive an expression for frequency of oscillations. Also calculate the minimum value of $A \; and \; \beta$.				
			(4)	**(4)**	**(2)**	**(10)**
	c.	Calculate the frequency of oscillations in Colpitt's oscillator if $C_1 = C_2 = 3nF, L = 200\mu H$. Draw the circuit diagram.				
			(3)	**(4)**	**(2)**	**(5)**
		UNIT -V	**L**	**CO**	**PO**	**M**
9	a.	Compare BJT and FET on different parameters.				
			(2)	**(5)**	**(1)**	**(5)**
	b.	Explain the construction of JFET and its characteristics.				
			(2)	**(5)**	**(1)**	**(10)**
	c.	Explain the dc analysis and working of fixed bias circuit of JFET.				
			(2)	**(5)**	**(1)**	**(5)**
10	a.	Consider JFET in common source configuration working with self bias , bypassed source resistance mode. Obtain expressions for input impedance, output impedance and voltage gain. Draw the small signal model				
			(3)	**(5)**	**(2)**	**(6)**
	b.	For the voltage divider bias circuit of JFET, $R_1 = 22k\Omega$, $R_2 = 12k\Omega, R_D = 1k\Omega, R_S = 2.2k\Omega, V_{DD} = 10V, I_{DSS} = 10\ mA, V_p = -3V$. Calculate the drain current, voltage between gate and source, voltage between drain and source, voltage at the gate and source.				
			(3)	**(5)**	**(2)**	**(10)**
	c.	Compare *D-MOSFET* and *E-MOSFET* devices.				
			(2)	**(5)**	**(1)**	**(4)**