## **B.Tech. DEGREE EXAMINATION, DECEMBER 2023**

Fourth Semester

## 18ECC201J - ANALOG ELECTRONIC CIRCUITS

(For the candidates admitted from the academic year 2020 - 2021)

Note:			m 1	. = 4 · · ·			
(i)		Part - A should be answered in OMR sheet within first 40 minutes and OM	AR shee	t shoul	d be	han	ded
(ii)		over to hall invigilator at the end of 40 <sup>th</sup> minute.  Part - B & Part - C should be answered in answer booklet.					
(11)		1 att - B & 1 att - C should be answered in answer bookies.					
Time:	3	hours	1	Max. I	Mark	cs: 1	00
				Mark	DY	-00	DO.
		$PART - A (20 \times 1 = 20 Marks)$		Marks	BL	CO	PU
		Answer ALL Questions					_
	1.	What is meant by stability of amplifier?	10	1	1	1	2
		(A) The amplified signal must (B) Amplifier should not have a finite amplitude oscillation	ve self				
		(C) The input and output signal (D) The ratio of the input	it and				
		must be proportional output signal must be fini-					
	2.	The ideal values for the input resistance $R_i$ and output resistance $R_i$	₹ <sub>0</sub> of a	1	2 .	1	2
		transconductance amplifier are					
		(A) $R_i = 0$ and $R_o = 0$ (B) $R_i = \infty$ and $R_o = \infty$					
		(C) $R_i = 0$ and $R_o = \infty$ (D) $R_i = \infty$ and $R_o = 0$					
	3.	The signal to be amplified is current signal and the output desired voltage signal. Which of the following amplifier can perform this task (A) Voltage amplifier (B) Current amplifier (C) Trans conductance amplifier (D) Trans resistance amplifier	k?	1	1	1	3
	4	General representation of the frequency response curve is called		1	1	1	3
	••	(A) Bode plot (B) Miller plot					
		(C) Thevenin plot (D) Bandwidth plot					
	5.	A certain D-MOSFET is biased at $V_{GS} = 0V$ . Its data sheet sp	ecifies	1	2	2	3
		$I_{DSS} = 20  \text{mA}$ and $V_{GS(off)} = -5  \text{V}$ . The value of drain current is					
		(A) 20 mA (B) 0 mA					
		(C) 40 mA (D) 10 mA					
	6.	A CS amplifier has a load resistance of $10k\Omega$ , $R_D = 820\Omega$ . If $g_m$	=5mS	1	2	2	2
		and $V_{in} = 500 mV$ , the output signal voltage is					
		(A) 2.05 V (B) 25 V					
		(C) 0.5 V (D) 1.89 V					
	7.	With a 30 V $V_{DD}$ and 8 k $\Omega$ drain resistor, what is the E MOSFET 0 voltage, with $I_D = 3mA$ ?	) point	1	2	2	3

(B) 10 V

(D) 30 V

(A) 6 V

(C) 24 V

8.	An n channel D-MOSFET with a pos			1	1	2	2
	· /	` '	Enhancement mode				
	(C) Cut off	(D)	Saturation				
9.	If the output of an amplifier is 10 feedback to the input then feedback to			1	2	3	2
	(A) 10	(B)					
	(C) 0.01	(D)					
10.	The gain of an amplifier without fee of 3 dB is applied, the gain of the am	plifie	r will become	1	2	3	3
	(A) 5 dB	. /	300 dB 97 dB				
	(C) 103 dB	(ש)	97 db				
11.	Oscillators have		The state of the s	:0C1	1	3	2
	(A) No feedback	(B)	Negative feedback				
	(C) Positive feedback	(D)	Either positive or negative				
			feedback				
12.	The feedback factor $\beta$ at the frequencial oscillator is	iency	of oscillation of a wein bridge	1	1	3	2
	(A) 3	(B)	1/3				
	(C) 1/29	(D)	3/29				
12	The conversion officiency of a class	C 0m	nlificacio	1	2	4	3
15.	The conversion efficiency of a class (A) 50%		78.5%.				
	(C) Larger than 78.5%	, ,	Lesser than 78.5%				
	(c) Larger trans. Fore, v	(-)					
14.	For a perfect power amplifier output if the output impedance is halved.	-		1	1	4	2
	(A) Halved		Squared				
	(C) Doubled	(D)	Square rooted				
15.	What is the maximum efficiency of fed load connection?	a clas	ss A circuit with a direct or series	1	2	4	3
	(A) 90%	(B)	78.5%				
	(C) 50%	(D)	25%				
16.	configuration in order to produce an			1	1	4	3
	(A) A (C) C	\ /	AB				
17		. ,		1	2	5	2
1/.	For BJT, two transistor current $I_{REF} = 0.62mA$ , the load current $I_0$	is					-
	(A) 1.2 mA	` /	2 mA				
	(C) 0.42 mA	(D)	0.60 Ma				
18.	The increased $r_0$ of the Wilson curre	ent so	urce is due to	1	2	5	3
	(A) Negative feedback	(B)	Positive feedback	0			
	(C) Cascade configuration	(D)	Stable bias current				

19.	The ability of a differential amplifier to reject a common mode signal is  (A) Differential mode gain  (B) Common mode rejection ratio  (C) Differential mode rejection (D) Common mode gain ratio	L La Al	1	5	3
20.	A MOSFET based two transistor current source has $I_{ref} = 100 \mu A$ and	1	2	5	3
	$\lambda = 0.01V^{-1}$ , then the output resistance is (A) $1k\Omega$ (B) $1 \text{ m}\Omega$				
	(C) $10 \text{ m}\Omega$ (D) $10\text{k}\Omega$				
	$PART - B (5 \times 4 = 20 Marks)$	dala 1		~~	
	Answer ANY FIVE Questions	Marks	BL	CO	<b>PO</b> 2
21.	What is DC load line? How is Q point plotted on the DC load line?	4	2	1	2
22.	Sketch the small signal equivalent circuit of NMOS and write the formula for $g_m$ and $r_o$ .			2	3
23.	Compare voltage series and current shunt feedback amplifier topologies.	4	2	3	3
24.	Construct an amplifier which conducts for less than 180° of the given input signal.		3	4	3
25.	Sketch the basic three transistor current source.			5	2
26.	26. Calculate the corner frequency and maximum gain of a bipolar common emitter circuit with a coupling capacitor. Given		3	2	3
	$V_{BE(ON)} = 0.7V, \ R_{si} = 0.1k\Omega, \ \beta = 100, \ V_A = \infty,$ $I_{CQ} = 1.81mA,$				
	$R_1 = 51.2k\Omega$ , $R_2 = 9.6k\Omega$ , $R_c = 2k\Omega$ , $R_E = 0.4k\Omega$ and $C_1 = 1\mu F$ .				
27.	Define $g_m$ , $r_{\pi}$ and $r_o$ of BJT amplifier.	4	3	1	3
	$PART - C (5 \times 12 = 60 Marks)$ Answer ALL Questions	Marks	BL	со	PO
28. a.	A CE amplifier is fed with the voltage source Vs of internal resistance $R_s = 500\Omega$ , $R_1 = 47k\Omega$ $R_2 = 5k\Omega$ , $R_c = 4.7k\Omega$ and $R_E = 500\Omega$ . The	12	3	1	3
	transistor parameters are $\beta = 100$ , $V_{BE} = 0.7V$ , $V_A = \infty$ and $V_{cc} = +10V$ . Compute voltage gain, input resistance and output resistance.				
b.	(OR)  Draw the small signal model of cascode amplifier and derive the expression for voltage gain, input resistance and output resistance.			1	2
29. a.	Analyze the source follower amplifier for voltage gain, input impedance and output impedance.	12	3	2	2
	(OR)	12	2	2	3
b.	Determine the voltage gain of the common gate amplifier circuit with the parameters $I_Q = 1mA$ , $V^+ = +5V$ , $V^- = -5V$ , $R_G = 100k\Omega$ .	12	3	2	3
	$R_D = 4k\Omega$ , $R_L = 10k\Omega$ , the transistor parameters $V_{TN} = 1V$ , $k_n = 1mA/V^2$ and $\lambda = 0$ . Assume the input current as $100 \sin \omega t  \mu A$ and $R_{si} = 50k\Omega$ .		24		

30. a.	Summarize how the shunt-shunt and series-shunt feedback topologies affect the input and output resistance of the closed loop amplifier.	12	2	3	3
b.i.	(OR) Design the RC elements of a wien bridge oscillator for operation at $f_0 = 10kHz$ .	6	3	3	2
ii.	Construct a Hartley oscillator and derive the frequency of oscillation.	6	2	3	3
31. a.	Sketch the transformer coupled class A amplifier and analyze the circuit for output voltage, power and efficiency.	12	3	4	3
	(OR)				
b.i.	For class B amplifier using a supply of $V_{cc} = 30V$ and driving a load of 16 $\Omega$ , determine the input power, output power and efficiency.	6	3	4	3
ii.	Calculate the total harmonic distortion for an output signal having fundamental amplitude of 2.5 V, second harmonic amplitude of 0.25 V, third harmonic amplitude of 0.1 V and fourth harmonic amplitude of 0.05V.	6	3	4	3
32. a.	Explain the two transistor current source with neat diagram and derive the expression for output current $I_0$ and resistance $R_0$ .	12	3	5	2
ъ.	OR) Describe the FET Wilson current source and derive the expression for output current $I_0$ and resistance $R_0$ .	12	3	5	2

\* \* \* \* \*