Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

(A constituent Institution of MAHE, Manipal)

## III SEMESTER B. TECH (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, DECEMBER 2018

## SUBJECT: ANALOG ELECTRONIC CIRCUITS [ELE 2105]

REVISED CREDIT SYSTEM

Tim	e: 3 Hours	Date: 01, December 2018	Max. Marks: 50
Instructions to Candidates:			
	<ul> <li>Answer ALL the question</li> </ul>	15.	
	<ul> <li>Missing data may be suita</li> </ul>	ably assumed.	
1A.	Determine $v_0$ for each of the voltage of diode is 0.7V.	network shown in Fig Q1A. 1, if $v_i = 8 \sin \omega t$ . As	ssume cut-in (03)
1B.	Consider the Zener voltage re $V_z$ =15.4V. The power rating of Determine (a) the range of did	gulator circuit shown in Fig Q1B. Let $V_I = 60V$ , $R_i$ f the diode is 4W and the minimum diode current is ode currents. (b) the range of load resistance.	= 150Ω and to be 15mA. (02)
<b>1C</b> .	For the circuit shown in Fig Q enter the triode region? Given	1C, what is the minimum allowable value of $V_{DD}$ if $\mu_n C_{ox} = 200 \mu A/V^2$ , $V_{TH} = 0.4V$ . Assume $\lambda$ =0.	<i>M</i> <sub>1</sub> must not <b>(02)</b>
1D	Design a clamper circuit using as shown in Fig Q1D.	g Ideal diode to obtain the output waveform for the	e given input (03)
2A.	Design the circuit to obtain a c 'L' is 0.5µm, Width 'W' is 5µm,	current of 100uA. Find $R_D$ , $V_D$ . Assume $V_{TH}$ =0.5, Ch $\mu_n C_{ox} = 300 \mu A/V^2$ . Refer Fig Q2A.	annel length (02)
2B.	For the MOSFET circuit shown if $V_{TH} = 0.3V$ , $W/L = 20$ , $\mu_n C$	th in the Fig Q2B find drain current, $V_{DS}$ , overall small $v_{ox} = 100 \mu A/V^2$ .	ll signal gain, <b>(05)</b>
2C.	For the circuit shown ir $10mA$ , determine $v_0$ . Draw the	the Fig Q2C, Assume $V_{TH}$ =0.6V, $g_m = 3r_m$ e small signal model for the same.	nA/V, i <sub>sig</sub> = <b>(03)</b>
3A.	Determine the overall gain of is 0.2V. Find the output resista	cascaded amplifier circuit shown in Fig Q3A. $V_{TH}$ o ance of the circuit and draw the small signal model	f M1 and M2 . <b>(06)</b>
3B.	The mid-band gain of RC co 100KHz. Find the frequency a the same.	upled amplifier is 31.62277V/V. The band width at which voltage gain is 28dB. Draw the frequency	n is 1KHz to response of (02)
3C.	An amplifier rated at 30W ou required for full power outpu amplifier gain is 45 dB.	tput is connected to $8\Omega$ speaker. Calculate (a) the t if power gain is 20dB. (b) the input voltage for ra	input power ted output if (02)
4A.	Determine (W/L) of the MOS $V_o = 0.9 V$ and $I_{ref} = 90 \mu A$ . Ass	FET and resistance R in the circuit shown in Fig Q ume $M_1$ and $M_2$ are identical, $\mu_n C_{ox} = 90 \ \mu A/V^2$ , $V_{TH}$	4A such that = 0.6 V. <b>(03)</b>
4B.	From the fundamentals derive amplifier due to coupling capa	e an expression for the lower cut-off frequency of a acitors.	a RC coupled <b>(03)</b>

- **4C.** With a neat circuit and diagram and necessary waveforms, obtain maximum efficiency of<br/>series fed class A power amplifier, hence design the circuit for the following specifications.<br/> $V_{DD}$ :20V, R<sub>D</sub>=16Ω, Q point:0.5A, 10V and maximum conversion efficiency is desired.(04)
- **5A.** What is overdrive voltage? Discuss the importance of this with relevant expressions. *(02)*
- **5B.** Five identical cascaded amplifier have an overall upper 3dB frequency of 200KHz and a lower 3 dB frequency of 120Hz. What are  $f_L$  and  $f_H$  of each stage? (02)
- **5C.** A MOS differential pair operated at a bias current of 1 mA employs transistors with W/L = 200 and  $\mu_n C_{ox} = 0.6 \text{ mA/V}^2$ , using  $R_D = 5 \text{ k}\Omega$  and  $R_{SS} = 25 \text{ k}\Omega$ . Find the differential gain, common mode gain and the common mode rejection ratio if the output is taken single-endedly and the circuit is perfectly matched.
- **5D.** Derive an expression for CMRR of a dual input, dual output MOS differential pair. Also discuss the role of Active load in Differential amplifier. Support the explanation with relevant circuit diagrams.



ELE 2105

(02)

(04)