BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH   SEMESTER : V
BRANCH: EEE   SESSION : MO/2024

SUBJECT: EE357 ELECTRONIC DEVICES AND ANALOG CIRCUITS

TIME: 3 Hours   FULL MARKS: 50
INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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Q.1(a)	Discuss the transition capacitance and the diffusion capacitance of a p-n junction diode with expression. Determine η, if the diode current is 0.6 mA when the applied voltage is 400mV and 20 mA when the applied voltage is 500mV. Assume ${kT}/{q} = V_T = 25\ mV$.	[5]	1	2,3
Q.1(b)	Identify the difference between LED and Laser diode. Explain the working of bridge rectifier with the help of circuit diagram and neat waveforms. Give the expressions for RMS current, PIV, Ripple factor and efficiency.	[5]	1	1,2
Q.2(a)	Draw the circuit diagram for fixed bias considering an n-p-n transistor in the CE configuration. Derive the expressions for its stability factors.	[5]	2	3
Q.2(b)	Distinguish between an enhancement-type and a depletion-type MOSFET. Describe the parameters transconductance g_m, drain resistance r_d and amplification factor μ of a JFET. Establish a relation between them.	[5]	2	3
Q.3(a)	Draw and explain the h-parameter equivalent circuit of a transistor in CE configuration. Write the expressions for input impedance, output impedance, voltage gain and current gain. The h-parameters of a Transistor at I_C = 8 mA, V_{CE} = 10 V and at room temperature are h_{ie} = 1 kΩ, h_{oe} = 2 x 10⁻⁵ A/V, h_{fe} = 50, h_{re} = (2.5 x 10⁻⁴). At the same operating point, f_T = 60 MHz and C_{ob} = 2 pF. Compute the values of hybrid-π parameters transconductance, base spreading resistance and diffusion capacitance.	[5]	3	3
Q.3(b)	With the help of circuit diagram explain the small signal equivalent circuit of MOSFET CS amplifier and obtain the expressions for input impedance, output impedance and voltage gain.	[5]	3	4
Q.4(a)	Draw the small signal equivalent circuit of BiCMOS Darlington pair configuration and explain composite transconductance. Define differential gain, common-mode gain, and CMRR and illustrate the relationship between them.	[5]	4	3
Q.4(b)	Explain the working of transformer-coupled class A amplifier using circuit diagram and show that maximum collector efficiency of this amplifier is 50%.	[5]	4	4
Q.5(a)	Explain with circuit diagram a negative feedback amplifier and obtain the expression for its closed loop gain. Explain the terms feedback factor and open-loop gain. The open loop gain of an Amplifier is 50,000. When negative feedback is introduced into the Amplifier, gain decreases to 10,000. Calculate the feedback factor and express the gain with negative feedback and the amount of feedback in dB.	[5]	5	3
Q.5(b)	Explain the operation of a Hartley Oscillator using circuit diagram. In a Hartley oscillator, the value of the capacitor in the tuned circuit is 500 pF and the two sections of coil have inductances 38 μH and 12μH. Find the frequency of oscillation and the feedback factor β.	[5]	5	5

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