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

CLASS: BTECH **SEMESTER: II**
BRANCH: BIOTECH/CIVIL/CHEMICAL/MECH/PIE **SESSION: SP/2023**

SUBJECT: EC101 BASICS OF ELECTRONICS AND COMMUNICATION ENGINEERING
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 handbook/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Explain the breakdown mechanism in a P-N junction diode. Also illustrate the types of capacitances and their reason of occurrence in a P-N junction diode.	[5]	1	2
Q.1(b)	A full-wave rectifier uses two diodes, the internal resistance of each diode may be assumed constant at 20 Ω. The transformer r.m.s. secondary voltage from centre tap to each end of secondary is 50 V and load resistance is 980 Ω. Find: (i) the mean load current (ii) the r.m.s. value of load current.	[5]	1	5
Q.2(a)	What do you mean by inversion of channel in MOSFET? Explain channel formation in JFET with neat diagram.	[5]	2	2
Q.2(b)	A transistor used in CE arrangement has the following set of h parameters when the d.c. operating point is V_{CE} = 10 volts and I_C = 1 mA : hie = 2000 Ω; hoe = 10^{-4} mho; hre = 10^{-3}; hfe = 50. Determine (i) input impedance (ii) current gain and (iii) voltage gain. The a.c. load seen by the transistor is R_L = 600 Ω. Assume approximate values up to the reasonable approximations.	[5]	2	5
Q.3(a)	Explain any operational amplifier circuit as an application of negative feedback. Draw the circuit of differentiator using op-amp and derive the expression for its output voltage.	[5]	3	1&2
Q.3(b)	Draw the circuit diagram of a Colpitt's Oscillator explaining Barkhausen's criteria for sustained oscillations. Determine the (i) operating frequency and (ii) feedback fraction for Colpitt's oscillator which has two capacitors of values 1 nF and 10 nF connected in parallel with an inductor of value 15 μH.	[5]	3	1&3
Q.4(a)	State and prove any two theorems of Boolean algebra with its duals.	[5]	4	1&3
Q.4(b)	Draw 4-bit parallel adder/subtractor circuit and explain its working using truth table & suitable logic expressions.	[5]	4	2
Q.5(a)	Draw the block diagram showing elements of communication system. What is the need of modulation in communication system?	[5]	5	1&2
Q.5(b)	Define Frequency modulation. Derive the frequency modulated wave expression using a single-tone sinusoidal message signal. Also, draw its time-domain representation.	[5]	5	2

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