Roll No.:……..

National Institute of Technology Hamirpur (HP)

Name of Examination: END-SEMESTER EXAMINATION, December 2020

Branch: Dual Degree Integrated E&CE **Semester** : 5th

Course Name: **Electronic Device Modeling** **Course Code** : ECD-314

Time: 2 Hours **(Online)** **Maximum Marks: 50**

Note:

i) *All questions are compulsory. Assume any missing data.*

ii) ***Name the answer sheet file as: YourRollNo-ecd314-FinalExam.pdf***

iii) *Write your Roll No., Subject name, Subject code on top of the first sheet & put your signatures with Date at the bottom of each sheet of the answer booklet.*

iv) *After the examination is over,* ***you will get 10 minutes to scan and upload your answer booklet as pdf*** *on* ***Google drive or Google classroom*** *or Teacher's email id. Delay in submission after this time can lead to deduction of marks or rejection of the whole answer booklet file.*

1.	(i)	Sketch self-explanatory equivalent model of an N-MOSFET showing all the parasitics. Hence give the geometric effects on MOSFET threshold voltage?	**5**
	(ii)	The drawn gate-length of a MOSFET is 1μm. The Source/Drain overlap is 0.1μm each. The gate width is 3μm. The thickness of the gate-oxide of the device is 30nm. Determine the gate-drain capacitance of the device for cut-off condition and gate-source capacitance of the device for saturation region.	**10**
2.	(i)	Differentiate between a BJT and a MOSFET in a tabular way?	**5**
	(ii)	Give Ebers Moll ac and dc equivalent circuit models of a BJT.	**10**
3.	a)	Gate of NMOS is biased 2V above its threshold voltage. When the drain voltage is 2V, the transconductance of the device is 500μA/V and its C_{GS} is 50fF. The gate length and width are 0.5μm and 1.5μm respectively. The GS and GD overlaps are 0.1μm each and channel length modulation parameter is $0.05V^{-1}$. What will be the effective mobility of the channel?	**10**
	b)	Explain the working of MODFETs & MESFETs.	**10**

$DATA: \varepsilon_o = 8.854\times10^{-12} F/m, \varepsilon_{ox} = 4, \varepsilon_{Si} = 12, n_i = 1.5\times10^{16} m^{-3}, k = 1.38\times10^{-23} J/K,$

$R = (np - n_i^2)/[\tau_n\{p + n_i \exp((-(E_t - E_i))/kT)\} + \tau_p\{n + n_i \exp((E_t - E_i)/kT)\}]$