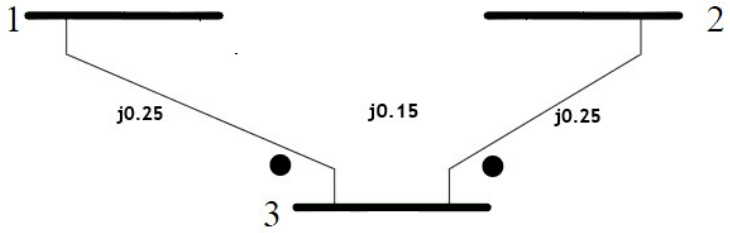
BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH **SEMESTER: I**
BRANCH: EE **SESSION: MO/2025**

SUBJECT: EE509 ADVANCED POWER SYSTEM ANALYSIS

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.

			CO	BL
Q.1(a)	Draw and explain the steady state modelling of generator, transmission lines, and transformer (nominal turns ratio). How is the generator model for steady state different from that of transient?	[5]	I	1,2
Q.1(b)	Describe the various load models used in power systems. What loads are in general present in a typical load bus of a power system network, give percentage of each?	[5]	I	1
Q.2(a)	Derive the load flow equation in polar form. Write down the load flow equations in rectangular form. Write the algorithm for solving load flow problem using Newton Raphson method.	[5]	I, II	2
Q.2(b)	A section of a power system network is shown below, bus 1 and bus 2 are connected to bus 3 the impedances of the branches are shown in per unit. The two branches are coupled, the mutual inductance is shown along with dots. Develop the Ybus for this section. 	[5]		6
Q.3(a)	Define power quality. Enlist different types of power quality disturbances. What are the sources of power quality disturbances? What are the devices used to correct these power quality disturbances?	[5]	I	1,2
Q.3(b)	Write down the power flow decoupled equations. Write the assumptions made for developing decoupled power flow method. Describe B' and B" matrices used in decoupled power flow method.	[5]	I, II	1,2
Q.4(a)	Prove that the diagonal element of bus impedance matrix represents the Thevenin's impedance of the respective bus. Also write the Thevenin's impedance of network between any two arbitrary buses *i* and *j*.	[5]	III	3
Q.4(b)	Describe how the original Z_{bus} will be modified if an impedance Z_b from a new bus 'p' is added to an existing bus 'k', show the modified impedance matrix also.	[5]	III	2
Q.5(a)	In context of security analysis, what are the operating states of power system? Describe contingency analysis with an example.	[5]	I, IV	2
Q.5(b)	Why are linear sensitivity factors used in contingency analysis. Define the different sensitivity factors. What are the different methods used for contingency analysis?	[5]	I, IV	1,2

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