

Design Project
Distribution System Analysis and Automation
Submission Date: 03 May 2023

Instructions

1. The problem is an open ended problem. The minimum requirement is mentioned, but in case you want to add some more analysis, it is allowed. Extra efforts made will be considered while evaluation.
2. There will be three presentations as per the following schedule.
 First Presentation- 24 April 2023
 Second Presentation - 27 April 2023
 Final Presentation- 1 May 2023
3. Report Submission – 3rd May 2023.
4. Please follow the instructions and timelines strictly.
5. Follow the instructions provided for the report separately.
6. You can use software to solve the problem. But, the code is to be submitted with the report.

Evaluation

During the presentation and final report. The project will be evaluated based on the (10 points)

- Engineering knowledge (10 points)
- Problem analysis (10 points)
- Design/development of solutions (15 points)
- Conduct investigations of complex problems (10 points)
- Modern tool usage (15 points)
- Ethics (20 points)
- Individual and team work (10 points)
- Communication (10 points)

Problem Statement: The electrical maintenance section of the NIT Kurukshetra is planning for to install a new power distribution system in the campus. The source of the power will be the UHBVN substation near the Kirmach Road. It is connected to the substation at NIT Kurukshetra. The location of the buses and impedance of the conductor is given as

Line Number	From Bus	To Bus	R(Ω)	X(Ω)
1	Substation UNBVN	Substation at NIT Kurukshetra	0.0922	0.0477
2	Substation at NIT Kurukshetra	Training and Placement Cell	0.493	0.2511
3	Training and Placement Cell	H4	0.366	0.1864
4	H4	H5	0.3811	0.1941
5	H5	H6	0.819	0.707
6	H6	H3	0.1872	0.6188
7	H3	H2	1.7114	1.2351
8	H2	H1	1.03	0.74
9	H1	H11	1.04	0.74
10	H11	H8	0.1966	0.065
11	H8	H7	0.3744	0.1238
12	H7	H9	1.468	1.155
13	H9	H10	0.5416	0.7129
14	H10	K. Chawla Hostel	0.591	0.526
15	K. Chawla Hostel	Alaknanda Bhawan	0.7463	0.545
16	Alaknanda Bhawan	Bhagirathi Bhawan	1.289	1.721
17	Bhagirathi Bhawan	Residential Area-1	0.732	0.574
18	Substation at NIT Kurukshetra	Admin Building	0.164	0.1565
19	Admin Building	Market	1.5042	1.3554
20	Market	Residential Area-2	0.4095	0.4784
21	Residential Area-2	Ground	0.7089	0.9373
22	H6	LHC block	0.203	0.1034
23	LHC block	MCA Deptt	0.2842	0.1447
24	MCA Deptt	SCOE	1.059	0.9337
25	SCOE	Applied mechanics block	0.8042	0.7006

26	Applied mechanics block	Civil Deptt	0.5075	0.2585
27	Civil Deptt	Electrical Deptt	0.9744	0.963
28	Electrical Deptt	Road lighting	0.3105	0.3619
29	Road lighting	Senate hall	0.341	0.5302
30	Training and Placement Cell	CSE Deptt	0.4512	0.3083
31	CSE Deptt	ECE Block	0.898	0.7091
32	ECE Block	Library	0.896	0.7011

The load connected and their location is given as

Load	Location	Real Load (kW)	Reactive Load (kVAR)
L2	Substation at NIT Kurukshetra	100	60
L3	Training and Placement Cell	90	40
L4	H4	120	80
L5	H5	60	30
L6	H6	60	20
L7	H3	200	100
L8	H2	200	100
L9	H1	60	20
L10	H11	60	20
L11	H8	45	30
L12	H7	60	35
L13	H9	60	35
L14	H10	120	80
L15	K. Chawla Hostel	60	10
L16	Alaknanda Bhawan	60	20
L17	Bhagirathi Bhawan	60	20
L18	Residential Area-1	90	40
L19	Admin Building	90	40
L20	Market	90	40
L21	Residential Area-2	90	40
L22	Ground	90	40
L23	CSE Deptt	90	50
L24	ECE Block	420	200
L25	Library	420	200
L26	LHC block	60	25
L27	MCA Deptt	60	25
L28	SCOE	60	20
L29	Applied mechanics block	120	70
L30	Civil Deptt	200	600
L31	Electrical Deptt	150	70
L32	Road lighting	210	100
L33	Senate hall	60	40
Total		3715	2300

It is required to analyze to system performance and identify the active power flow, reactive power flow, voltage profile, current profile, losses occurring in the system.

It is desired that the system voltage is kept as $1+0.05$ pu. The losses of the system are to be kept at a minimum.

For power back-up the institute wants to install a Diesel Gen Set. Suggest a size and location of the DG set. Also, analyze the system performance before and after installation of the DG Set.

The government wants to install roof top solar plant also. The capacity suggested is 1 MWp. It is to be installed on the building roofs on a distributed manner. Suggest the location and capacity (in MWp) at each node to be connected. Also, analyze the system performance before and after installation of the DG Set.

(Consider the fixed capacity of the solar PV for the analysis. Do not consider the irradiance variation)

Analyze the system performance before and after connecting DG Set and PV plant together.

In case the system performance goes down. Suggest the necessary changes in the system.