Hall Ticket Number:

Code No. : 17353 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.E.E.) VII-Semester Main & Backlog Examinations, Dec.-23/Jan.-24

Power System Operation and Control (PE-II)

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Draw the flowchart for Economic Load Dispatch (ELD) problem without considering transmission losses?	2	2	1	1,2,3,12
2.	A power system has plants supplying P_1=125MW and P_2= 250MW. The loss coefficients in MW^{-1} are B_{11}=0.001, B_{22}=0.0013 and B_{12}= -0.0001. Evaluate the penalty factor of plant-1?	2	3	1	1,2,3,12
3.	Explain in brief about Unit commitment problem in power system?	2	2	2	1,2,3,12
4.	Discuss the importance of spinning reserve in power system?	2	3	2	1,2,3,12
5.	Draw the block diagram of a single area load frequency control model with integral controller?	2	1	3	1,2,3,12
6.	Sketch the droop characteristics of an alternator?	2	1	3	1,2,3,12
7.	Draw the power angle curve indicating the accelerating and decelerating areas for a 3-phase fault at the middle of the line as shown in the figure below? 	2	2	4	1,2,3,12
8.	List out the methods of transient stability improvement?	2	1	4	1,2,3,12
9.	Discuss in brief about tap changing transformer for voltage control?	2	1	5	1,2,3,12
10.	Explain disadvantages of low power factor in power system?	2	2	5	1,2,3,12
	Part-B (5 × 8 = 40 Marks)				
11. a)	Explain the step-by-step algorithm for Economic Load Dispatch problem considering transmission losses?	4	1	1	1,2,3,12
b)	The fuel inputs per hour of plant 1,2 and 3 are given as $F_1 = (0.006\,P_1^2 + 5.5P_1 + 400)$ Rs/Hr $F_2 = (0.004P_2^2 + 5.3P_2 + 500)$ Rs/Hr $F_3 = (0.009\,P_3^2 + 5.8P_3 + 200)$ Rs/Hr Neglecting transmission losses in the system, determine the economic operating schedule and the corresponding cost of generation, if the demand is 975MW. Assume no limits of power generation of each unit?	4	3	1	1,2,3,12

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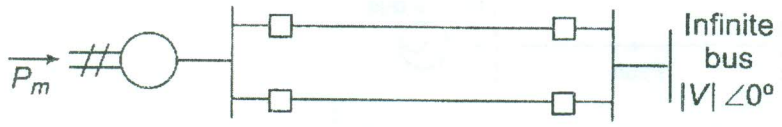
12. a)	The system data is as follows **Unit No** | **Loading Limits (MW)** | **Fuel cost coefficients** | P_{min} | P_{max} | a_i (Rs/MW²Hr) | b_i (Rs/MWHr) | c_i (Rs/Hr) 1 | 100 | 400 | 0.006 | 7 | 600 2 | 50 | 300 | 0.01 | 8 | 400 3 | 150 | 500 | 0.008 | 6 | 500 If the load on the system is 600MW, which are the units to be in operation as per priority list method of unit commitment?	4	3	2	1,2,3,12
b)	In a unit commitment problem, illustrate the necessary steps to follow, prior to shutting down a unit?	4	1	2	1,2,3,12
13. a)	Illustrate the operation of typical speed governing system with a neat sketch, derive its mathematical model and represent the same in block diagram model?	4	2	3	1,2,3,12
b)	Two generators rated 1000MW and 500MW are operating in parallel with a droop of 5% and 4% respectively. The frequency of the system is 50Hz at no load. How a load of 800MW shared between them? What is the system frequency at this loading condition?	4	3	3	1,2,3,12
14. a)	Derive the expression for critical clearing angle for a three phase fault on middle of one of the transmission line, for the system shown below?  	4	2	4	1,2,3,12
b)	Define steady state stability? Determine the condition for steady state stability for a generator connected to infinite bus?	4	2	4	1,2,3,12
15. a)	Explain the static capacitor method of power factor improvement in power system?	4	2	5	1,2,3,12
b)	A 1-phase, 2 kW induction motor has a power factor of 0·75 lagging. A capacitor is connected across the load and power factor raised to 0·95 lagging. Determine the kVAR rating of the capacitor to be connected?	4	3	5	1,2,3,12
16. a)	The transmission loss-coefficients are given as below in per unit(pu) $$B = \begin{bmatrix} 0.01 & -0.001 & -0.002 \\ -0.001 & 0.02 & -0.003 \\ -0.002 & -0.003 & 0.03 \end{bmatrix}$$ Three plants supply the power are $P_{G1} = 1pu$, $P_{G2} = 2pu$ and $P_{G3} = 3pu$. Calculate the transmission loss in pu and the incremental transmission losses in pu with respect to plant-1, plant-2 and plant-3?	4	3	1	1,2,3,12

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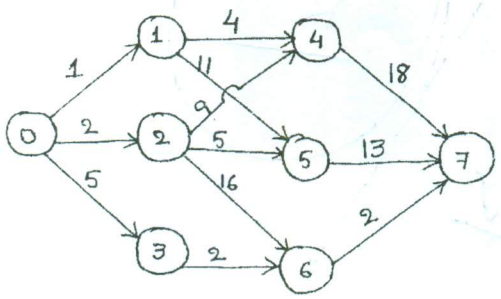
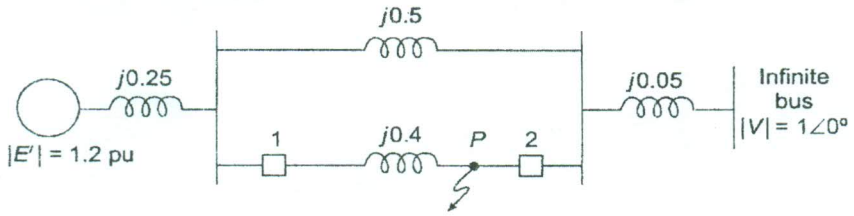
Code No. : 17353 N/O

b)	Using Dynamic programming method, illustrate the minimum cost required to reach from Source (0) to destination (7). Assume $P_i(k) = 0$, ∀ i, k., where i and k refers to state and stage respectively. $P_i(k)$ refers to self-cost at each stage. The number on the line represents cost in rupees to travel from one state to other state. Assume the data wherever required suitably and specify the same? 	4	3	2	1,2,3,12
17.	Answer any ***two*** of the following:				
a)	Show that the static error in frequency can be reduced to zero for an isolated single area load frequency control problem with integral controller?	4	2	3	1,2,3,12
b)	Determine the critical clearing angle for the system shown below, when a three-phase fault occurs at the point P. The breakers 1 and 2 open simultaneously for clearing the fault. The reactance values of various components are indicated on the diagram. The generator is delivering 1.0pu power at the instant preceding the fault. 	4	3	4	1,2,3,12
c)	Explain the operation of TCSC with a neat sketch? Draw its characteristics?	4	2	5	1,2,3,12

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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