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BIEE-022

B.Tech. – VIEP – ELECTRICAL ENGINEERING

(BTELVI)

Term-End Examination

December, 2018

00203

BIEE-022 : POWER SYSTEMS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Assume missing data suitably (if any). Use of scientific calculator is allowed.*

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1. (a) What is meant by percentage reactance ? Why is it preferable to express the reactances of various elements in percentage values for short circuit calculations ? Also list the advantages of per unit system. *7*

(b) Derive the expressions for total complex power in a 3-phase system in terms of symmetrical components of voltages and currents. *7*

2. (a) The estimated short circuit MVA at the bus bars of a generating station is 1,500 and that of another station is 1,000. The generated voltage of each station is 13·2 kV. Calculate the possible short circuit MVA at each station when they are linked by an interconnector cable having a reactance of 0·5 ohm. 7

(b) A single line to ground fault is more severe than a 3-phase fault at the terminals of an alternator. Explain in detail with suitable circuit. 7

3. (a) A 25 MVA, 13·2 kV alternator with solidly grounded neutral has a sub-transient of 0·25 pu. The negative and zero sequence reactances are 0·35 pu and 0·1 pu respectively. A single line to ground fault occurs at the terminals of an unloaded alternator. Determine the fault current and the line to line voltages. Neglect resistances. 7

(b) Describe in detail with the flow chart diagram, the computational method for short circuit calculations. 7

4. (a) Make a comparison between Gauss-Seidel and Newton-Raphson methods of load flow equations. 7

(b) Obtain the Y_{bus} matrix if the admittances between the various buses in a power system are given in the table below : 7

Buses	Admittances in pu
1 – 2	0·10
1 – 4	0·20
2 – 3	0·25
2 – 4	0·50
3 – 1	0·40
4 – 3	0·50

5. (a) Distinguish between steady state and transient stability. Derive the swing equation of a synchronous machine. 7

(b) Write short notes on ***one*** of the following : 7

(i) Protection of equipments against travelling waves

(ii) Wave equation for uniform transmission lines

6. (a) A 4 pole, 50 Hz, turbo-generator rated 30 MVA, 13·2 kV has an inertia constant H = 9·0 kW-s per kVA. Find out the kinetic energy stored in the rotor as synchronous speed. Also find the acceleration if the input less the rotational losses is 25,000 HP and the electrical power developed is 15,000 kW. 7

(b) Discuss the behaviour of travelling wave when it reaches the end of (i) a short circuited transmission line (ii) a line connected to a cable, and (iii) a line terminated by an impedance equal to surge impedance. 7

7. (a) A 200 kV 2 μsec rectangular surge travels along the line terminated by an inductance of 4 mH. Determine the voltage across the inductance and reflected voltage wave if the surge impedance of the line is 400 ohm. 7

(b) Explain Bewley's Lattice diagram. Explain the procedure for drawing Bewley's Lattice diagram with the help of suitable diagram. 7