Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **14EE2014** | **Duration :** | **3hrs** |
| **Sub. Name :** | **POWER SYSTEM ANALYSIS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Two generators rated at 10MVA, 11KV and 15MVA, 11KV respectively are connected in parallel to a bus. The bus bar feed two  motors rated 7.5MVA and 10 MVA respectively. The rated voltage  of the motor is 9 KV. The reactance of each generator is 12% and  that of each motor is 15% on their own ratings. Assuming 50MVA,  10KV base and draw the reactance diagram. | CO1 | 10 |
| b. | Illustrate in detail the need for system analysis in planning and operation of power system. | CO1 | 10 |
| (OR) | | | | |
| 2. |  | A 100 MVA, 33 KV, three phase generator has a reactance of 20 %.  The generator is connected to motors through transmission lines and  transformers. The motor has rated inputs of 30 MVA, 20 MVA and  50 MVA at 30 KV with 15 % sub transient reactance. The three phase transformers are rated at 110 MVA, 32 KV Δ/110 KV Y with  leakage reactance of 8 %. The line has a reactance of 45Ω. Selecting  the generator rating as base quantities in generator circuit, determine  base quantities in other parts of system and evaluate the p.u. values.  T2  T1  j45Ω  M1  M2  M3  100MVA,  33KV, | CO1 | 20 |
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| 3. | a. | The parameters of a 4-bus system are as follows. Draw the network and construct the bus admittance matrix. If the line connected between bus 1 and bus 3 is removed write the new Ybus.   |  |  |  | | --- | --- | --- | | Bus Code | Line Impedance (pu) | Charging Admittance (pu) (ypq/2) | | 1-2  2-3  2-4  3-4  1-3 | 1+j2  3+j9  2+j1  2+j8  1+j4 | j0.02  j0.03  j0.04  j0.02  j0.01 | | CO1 | 8 |
|  | b. | Derive the fault current expression for single line to ground fault occurs in a power system network. | CO2 | 12 |
| (OR) | | | | |
| 4. | a. | Explain briefly about the formation of bus impedance matrix with an illustration. | CO2 | 15 |
| b. | Write the step-by-step procedure for analyzing the symmetrical fault at a power system bus. | CO2 | 5 |
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| 5. | a. | Derive Gauss-Seidal algorithm for load flow studies. Give the flow chart and step by step procedure to implement the algorithm. | CO2 | 15 |
| b. | Give the reason i) NR load flow is preferred over Gauss-Seidal load flow in power industry. ii) majority of buses in a power system buses are load buses. | CO2 | 5 |
| (OR) | | | | |
| 6. | a. | Explain the step by step computational procedure for the Newton Raphson method in load flow studies with appropriate expression. | CO2 | 15 |
| b. | Construct the Jacobian matrix for a three bus power system (one slack bus, one PV bus and one PQ bus ). | CO2 | 5 |
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| 7. | a. | Derive the coordination equations for ED considering transmission losses. | CO3 | 5 |
| b. | The fuel cost characteristics of four power plants are given by  F1=0.0412P12+7.21P1+510 Rs/hr  F2=0.0194P22+7.85P2+310 Rs/hr  F3=0.0480P32+7.97P3+200 Rs/hr  F4=0.0340P42+6.40P4+300 Rs/hr  The power generation limits are  Plant 1: 150≤ P1≤600 MW  Plant 2: 100≤ P2≤500 MW  Plant 3: 50≤ P3≤250 MW  Plant 4: 100≤ P4≤350 MW  Find the ED schedule and the total fuel cost for a demand of 1250MW. | CO3 | 15 |
| (OR) | | | | |
| 8. | a. | How can we classify stability studies in power system? | CO2 | 5 |
| b. | Formulate the STHTS as an optimization problem. Clearly state various constraints. | CO3 | 8 |
| c. | Explain in detail the lambda iteration method for solving economic scheduling problem without transmission loss. | CO3 | 7 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | From the fundamentals of rotational dynamics, derive the swing equation of a synchronous machine. How will you use the swing equation for stability analysis? | CO2 | 15 |
| b. | Define Power Quality Problem. If you want to evaluate the power quality of an electricity consumer, list down the steps you will follow. | CO2 | 5 |