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Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET UNIVERSITY)



Ph.D. (Second Semester-Summer) Examinations, April – 2026
23SPPEEE2012 – AI Techniques in Power Systems
(EEE)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer ANY FIVE Questions.

(14 x 5 = 70 Marks) Marks

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|---|---|
| 1.a. Discuss multilayer ANN for dynamic stability assessment. | 8 |
| b. Design a single-layer ANN for bus voltage prediction in a 4-bus system with inputs P=80 MW, Q=40MVAR; weights $w_1=0.4$, $w_2=0.6$, bias=0.1; compute output V using sigmoid activation. | 6 |
| 2.a. Describe classical vs GA economic dispatch. | 7 |
| b. Explain backpropagation algorithm steps in power networks. | 7 |
| 3.a. Elaborate supervised learning activation functions in MLP for state estimation. | 7 |
| b. For regression task, target flow=200 MW, predicted 195 MW; compute MSE and gradient. | 7 |
| 4.a. Describe perceptron architecture for load flow. | 8 |
| b. Discuss fuzzy methods for economic dispatch. | 6 |
| 5.a. Fuzzify voltage error=0.03 pu into {NB, NS, Z, PS, PB} with $\mu_Z=0.6$, $\mu_{PS}=0.4$ using triangular functions. | 7 |
| b. Describe Mamdani fuzzy systems for load frequency. | 7 |
| 6.a. Outline fuzzy logic in reactive power control. | 7 |
| b. Describe mutation in GA for dispatch problems. | 7 |
| 7.a. Explain crossover operators vs traditional search. | 8 |
| b. Binary GA for 4 units over 3 weeks; decode 1011 to schedule, cost calculation. | 6 |
| 8.a. Outline learning rules in multilayer nets for security analysis. | 7 |
| b. Define fuzzy sets and operations for power control. | 7 |

---End of Paper---