2016-17
B.TECH. (ELECTRICAL) WINTER (VII SEMESTER) EXAMINATION
DIGITAL SIMULATION OF POWER SYSTEM (EE-432)

Maximum Marks-60
Credit-04
Time- 2 Hours

NOTE: (i) Answer all the questions.
(ii) Notations used have their usual meaning.
(iii) Assume suitable data, wherever necessary.

1. (a) What do you understand by the term “Primitive Network”? Write performance
        equation of a primitive network in impedance and admittance form. 04

(b) Derive the relations: i) \( Y_{BR} = B^T [y] B \)
    ii) \( Y_{BUS} = A_b^T Y_{BR} A_b \) 08

OR

1'. Prove \( \hat{Y}_{BR} \hat{Z}_{LOOP} = U \), where \( \hat{Y}_{BR} \) and \( \hat{Z}_{LOOP} \) are branch admittance and loop
    impedance matrices respectively of the augmented network. 12

2. Derive the expressions for the fault current and voltages during fault for a single
    line-to-ground fault at one of the buses in a large power system using
    Thevenin’s equivalent of the system. 12

OR

2'. What are the assumptions usually made in short circuit studies? Show that the
    symmetrical component transformation diagonalizes the impedance matrix in
    phase components for both stationary and rotating elements. 12

3. (a) What does FACTS stand for? What are its objectives? State different types of
        FACTS devices. 06

(b) Discuss the various methods used for reactive power compensation. 06

OR

3'. Derive the transfer function model of speed governing system for turbo-
    generators. 12

4. (a) Discuss the problem of “optimal power flow”. In what way it is different from
    usual load-flow study? 06

Contd... 2
5. (a) Explain the term "Contingency Analysis" with reference to Power Systems.

(b) Write notes on the following
   (i) State estimation
   (ii) Real-time Computer Control of Power Systems
B.TECH. (WINTER SEMESTER) EXAMINATION
ELECTRICAL ENGINEERING
ENERGY MANAGEMENT AND AUTOMATION
EE-434

Maximum Marks: 60
Credits: 04
Duration: Two Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.
Attempt questions in sequence and start each answer from a new page.
Structure your answer in a point wise format and avoid unnecessary details.

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Outline the 3 phases of energy audit process.</td>
<td>[12]</td>
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<td>OR</td>
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<tr>
<td>1'</td>
<td>Consider a building with 10,000 square meters of floor space. It uses $2.0 \times 10^6$ kWh and $6.8 \times 10^6$ MJ of natural gas in one year. Find the Energy Utilization Index (EUI) for this facility. Consider the same building as above, the annual cost for electric energy is INR153,200 and the annual cost for natural gas is INR 52,500. Find the Energy Cost Index (ECI) for this facility.</td>
<td>[12]</td>
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<td>2</td>
<td>Describe in detail the power system automation using SCADA.</td>
<td>[12]</td>
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<td>OR</td>
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<td>2'</td>
<td>Write a detailed note on IEC61850 Standard for SCADA</td>
<td>[12]</td>
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<tr>
<td>3</td>
<td>Describe the open system interconnection model (OSI) or ISO model of SCADA.</td>
<td>[12]</td>
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<td>4</td>
<td>Classify and describe in detail the three levels of Distribution Automation.</td>
<td>[12]</td>
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<td>OR</td>
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<td>4</td>
<td>Explain the tangible and intangible benefits of distribution automation system.</td>
<td>[12]</td>
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<td>5(a)</td>
<td>Describe in brief about the load management techniques for DSM.</td>
<td>(07)</td>
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<tr>
<td>5(b)</td>
<td>Write a brief note on implementation issues and strategies of DSM techniques.</td>
<td>(05)</td>
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<td></td>
<td>OR</td>
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<tr>
<td>5(b')</td>
<td>Write a short note on various tariff options and role of smart meters in DSM.</td>
<td>(05)</td>
</tr>
</tbody>
</table>
Answer all the questions.
Assume suitable data if missing.
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Q.No. M.M.

1(a) Define and differentiate between plant capacity factor and plant load factor. 04

OR

1(a') Discuss the effect of various factors in short term load forecasting. 04

1(b) A region has a maximum demand of 500 MW at a load factor of 50%. The load duration curve can be assumed to be a triangle. The utility has to meet this load by setting up a generating system which is partly hydro and partly thermal. The costs are as follows:
Hydro plant: Rs. 6000 per kW per annum + operating expenses Rs. 0.30 per kWh
Thermal plant: Rs. 3000 per kW per annum + operating expenses Rs. 1.30 per kWh
Determine the capacity of Hydro & Thermal power plant and energy generated annually by each. 08

2(a) What are the objectives of Tariff and importance of spot pricing? 04

2(b) The installed capacity of a thermal power station is 250 MW and the maximum demand on it is 200 MW at a load factor of 70%. The diversity between the consumer’s maximum demands is 1.5. The cost and other data of the system are as follows:

| Capital cost of plant = Rs. 36000 per kW | Fuel consumption = 0.8 Kg per kWh |
| Capital cost of transmission & distribution system = Rs 1200 x 10^6 | Fuel Cost = Rs. 720 per 1000 kg |
| Interest and depreciation = 10% | Other operating cost = 30% of fuel cost |
| Energy consumed by auxiliaries = 5% | Cost of metering and billing = Rs 60 x 10^6 per year |
| Energy loss in transmission & distribution system = 15% |

If the profit on fixed and operating cost is to be 25%, devise a two part Tariff. 08

Contd... 2.
2(b') A factory has an induction motor having a maximum demand of 800 kW at 0.707 pf lagging. The consumer is charged at Rs. 80 per kVA of the maximum demand per year. The increase in load is met by installing a synchronous motor of 200 hp (metric) and efficiency of 0.99. If the synchronous motor works on full load and at 0.8 pf leading find the difference in annual fixed charges of consumer.

3(a) Explain various hydro-thermal short term scheduling methods. Write the necessary equations and the significance of constant 'r' in the equation.

3(b) What are the advantages of Pumped storage plant? Compare its economics with an old steam plant to be used for peak load operation as an alternative to pumped storage plant.

OR

3(b') Discuss the method to determine the capacity of the run off river plant and steam plant when they supply a given load jointly.

4(a) What are the functional requirements of bus bar arrangements in power plants? Draw a single line diagram of sectionalized bus bar scheme.

4(b) With the help of a neat diagram explain speed regulating system of a steam turbine.

OR

4(b') With the help of a neat diagram describe a brushless excitation system for modern alternators.

5(a) What are the advantages of SF6 gas insulated substation?

5(b) What is the value and function of coupling capacitor used in PLCC?

5(c) What are the main functions performed by a EHV substation? Discuss the various aspects to be considered while designing EHV substation layout.

OR

5(c') What is Step potential? Discuss the main steps involved in the design of earthing grid of a EHV substation.
Answer all questions. Assume suitable data if missing. Notations used have their usual meaning.

Q.No. | Question | M.M.
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1(a) | Explain the role of Z-Transform and the concept of fictitious sampling in digital control. Also explain the effect of sampling period on stability of a discrete data system. | [04]
1(b) | Examine the stability of the following characteristic equation using Jury’s stability criterion. \( D(z) = 2z^4 + 2z^3 + 3z^2 + z + 1 = 0 \) OR Find the overall transfer function of the system shown in figure 1. | [08]
1’ | [12]
2(a) | Consider the system \( X(t) = \begin{bmatrix} 1 & e^{-t} \\ 0 & -1 \end{bmatrix} x(t) \) \( Y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix} x(t) \) Is this system observable at \( t = 0 \)? If yes, find \( x(0) \) when \( y(t) = e^t \) | [06]
2(b) | Define and explain with the help of suitable examples: i) Stabilizability ii) Reduced Order Observer | [06]
3(a) | Define and explain with the help of suitable examples: i) Incidental non-linearity ii) Limit Cycle | [04]
3(b) | Consider the closed loop system shown in fig.2. Using Describing Function method determine whether a Limit Cycle exists. Given \( G(s) = \frac{1}{s(s+1)(s+2)} \) | [08]
4(a) | Define and explain: i) Asymptotic Stability ii) Autonomous system | [04]
4(b) | Consider the nonlinear system: \( \dot{x}_1 = -2x_1 + x_1x_2 \) \( \dot{x}_2 = -x_2 + x_1x_2 \) | [08]

Contd...2.
Examine the stability of equilibrium points and determine the nature of phase portraits for the equilibrium points.

**OR**

4' Sketch the phase trajectory of the following system

\[ \frac{d^2x}{dt^2} + \left( \frac{dx}{dt} \right)^2 = 0 \]

With the initial conditions \( x(0) = 0 \) and \( \frac{dx}{dt} (0) = 1 \)

5(a) Define and explain

i) Admissible trajectory  ii) Optimal Control  iii) Fuzzy logic

**OR**

5'(a) Explain the working of Model Reference Adaptive Control.

5(b) Explain the principle of optimality and describe the salient features of dynamic programming for optimal control.

**OR**

5'(b) Explain in brief commonly used performance measures in optimal control.
2016-17
B.TECH. (AUTUMN SEMESTER) EXAMINATION
BRANCH: ELECTRICAL ENGINEERING
MICROPROCESSOR SYSTEM AND APPLICATIONS
EE-473

Maximum Marks: 60
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Duration: Two Hours

Answer all the questions.
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Q.No. Question M.M.

1. (a) Write the function of the following 8085 instructions. Specify their addressing modes.

   (i) DAD H  (ii) XRA A

   (b) Write a program and draw a flowchart to subtract two 8-bit numbers using indirect addressing mode.

   [04]

   [08]

OR

1’.(a) Show how the flag register is affected after the execution of the following instructions

MOV A, F5H
ADD A, 0BH

   (b) Write a program and draw a flowchart to add two 8-bit numbers using immediate addressing mode.

   [04]

   [08]

2. (a) With the help of flow chart, explain interrupt driven data transfer scheme. Why it is better than asynchronous data transfer scheme?

   [06]

   (b) List various interrupts available in 8085 microprocessor. Give the bit pattern of the accumulator for SIM instructions.

   OR

   (b) Why an interrupt controller is required. Discuss main feature of interrupt controller 8259A.

   [06]

3.(a) Give the control word format for I/O mode of 8255 programmable interface.

Write a program to initialize 8255 in the configuration below. (Assume address of the CW register as 23H).

- Port A: output with handshake,
- Port B: input with handshake
- Port C_{Lower}: output port, Port C_{Upper}: input port.

   [08]
(b) Draw the simplified block diagram of 8255PPI and write the function of chip select (CS) and read (RD) control signal of 8255.

OR

(b') List the registers present in 8259 chip? Mention operating modes of 8255 programmable peripheral interface.

4.(a) With a neat sketch show the architecture of 8086. Discuss the function of Bus Interface Unit (BIU) and Execution Unit of Intel 8086.

(b) What is the function of an index pointer and segment register in 8086?

OR

4'(a) Explain the concept of pipelining in 8086. What is the purpose of MN/MX pin in 8086 microprocessor?

(b) List various addressing modes of 8086 microprocessor. Explain with example Based Indexed with displacement mode. Briefly explain the maximum mode configuration of 8086.

5.(a) What is the difference between minimum and maximum modes of 8086? How are these modes selected in 8086 microprocessor?

(b) How many interrupts are available in 8086? Discuss the hardware interrupt NMI and INTR available in 8086.

OR

(b') What are assembler directives? Explain the function of the following assembler directives: (i) ASSUME (ii) EQU