2018-19  
B.E. (AUTUMN SEMESTER) EXAMINATION  
ELECTRICAL ENGINEERING  
ENERGY MANAGEMENT AND AUTOMATION  
EEE-434

Maximum Marks: 60  
Credits: 04  
Duration: Two Hours

Answer all questions.  
Assume suitable data if missing.  
Notations and symbols used have their usual meaning.

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>M.M.</th>
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<tbody>
<tr>
<td>1(a)</td>
<td>Explain the objectives and architecture of Energy Management System (EMS)?</td>
<td>[06]</td>
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<tr>
<td>1(b)</td>
<td>Discuss how Market Clearing Price (MCP) is determined in Power Exchange.</td>
<td>[06]</td>
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OR

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</table>
| 1(a’) | Explain the following terms:  
  i. Bilateral Transaction  
  ii. Regional Entity  
  iii. Short term Customer | [06] |
| 1(b’) | What do you mean by Power Pools? What are the advantages of centrally dispatched Power Pools? | [06] |
| 2(a)  | Define SCADA by explaining its functions and objectives.                 | [06] |
| 2(b)  | What is the operation of SCADA RTU. Write down the difference between PLC and RTU. | [06] |

contd... 2.
2(a') How is Data Acquisition, Data Communication and Data Presentation achieved in SCADA? [06]

2(b') Explain the four kinds of SCADA components that help SCADA perform its functions. [06]

3(a) What do you mean by Substation Automation? What is its advantage in communication technology? [06]

3(b) Differentiate between Single Board RTU and Modular RTU. Also write the software functions of RTU. [06]

4(a) What do you mean by Distribution Automation? Explain its four main functions. [06]

4(b) Draw a well labelled structure diagram of Distribution SCADA system. Write the functions of FTU, DTU and TTU. [06]

OR

4(b') Discuss the following:
  i. Geographic Information Service (GIS).
  ii. Consumer Information Service (CIS). [06]

5(a) What is the need of Demand Side Management (DSM)? What are the various ways in which Energy Load Scheduling is done as a part of DSM program? [08]

5(b) What are the obstacles or implementation issues in implementing DSM programs? [04]
2018-19  
B. E. (AUTUMN SEMESTER) EXAMINATION  
ELECTRICAL ENGINEERING  
POWER STATION PRACTICE  
EEE-435

Maximum Marks: 60  
Credits: 04  
Duration: Two Hours

Answer all questions.  
Assume suitable data if missing.  
Notations and symbols used have their usual meaning.

Q.No.                     Question                     M.M.  
1.  Discuss briefly the following terms:
    (a) Demand Factor  
    (b) Group Diversity Factor  
    (c) Load Factor  

    A group of 2 consumers has the following electricity demand pattern:

<table>
<thead>
<tr>
<th>Consumer A</th>
<th>Consumer B</th>
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<tbody>
<tr>
<td>Connected Load</td>
<td>Connected Load</td>
</tr>
<tr>
<td>2.5 kW</td>
<td>3 kW</td>
</tr>
<tr>
<td>Load from 12 midnight to 5 am</td>
<td>Load from 11 pm to 7 am</td>
</tr>
<tr>
<td>100 kW</td>
<td>NIL</td>
</tr>
<tr>
<td>from 5 am to 6 am</td>
<td>from 7 am to 8 am</td>
</tr>
<tr>
<td>1.1 kW</td>
<td>300 W</td>
</tr>
<tr>
<td>from 6 am to 8 am</td>
<td>from 8 am to 10 am</td>
</tr>
<tr>
<td>200 kW</td>
<td>1 kW</td>
</tr>
<tr>
<td>from 8 am to 5 pm</td>
<td>from 10 am to 6 pm</td>
</tr>
<tr>
<td>200 W</td>
<td>200 W</td>
</tr>
<tr>
<td>from 5 pm to 12 midnight</td>
<td>from 6 pm to 11 pm</td>
</tr>
<tr>
<td>500 W</td>
<td>600 W</td>
</tr>
</tbody>
</table>

(a) Calculate the demand factors of both consumers.  
(b) Find group diversity factor.  
(c) Find energy consumed by each consumer in 24 hours.

2(a). What do you understand by Demand Side Management (DSM)? Describe the tariff options for DSM.  

2(b). A 500 V 3 phase 50 Hz circuit takes 20 A at a power factor of 0.8 lagging. It is desired to improve the power factor to 0.95 by using a synchronous motor. The synchronous motor will drive a mechanical load of 10 h.p. The efficiency of the motor is 0.8. Find the kVA drawn by the motor and its power factor.

OR

2'(a). What are the causes of low power factor? Compare the advantages and disadvantages of using a synchronous condenser over a capacitor for power factor improvement.

... end.
2(b). A 440 V, 50 Hz star connected induction motor draws a line current of 40 A at 0.8 lagging power factor. It is desired to install a bank of delta connected capacitors to raise the overall power factor to 0.95. Determine kVAR rating of bank and the value of each capacitor of the bank.

3(a). Describe the advantages of combined operation of hydro and thermal power plants. [07]

OR

3(a’). Explain the Long term operational aspects of reservoir hydro plants and thermal plants. [07]

3(b). The two plant system shown in Fig.1 is to supply a load shown in Fig.2. The data is

\[ C_1 = (24 + 0.02P_1)P_1 \text{ Rs./hour} \]
\[ W_2 = (6 + 0.0025P_2)P_2 \text{ m}^3/\text{second} \]

The maximum capacity of hydro plant and steam plant is 360 MW and 250 MW respectively. Determine the operating schedules of the system using ‘Constant Hydro Generation’ method so that 148.6905 million m$^3$ water is used during the 24 hour period. Also, calculate the cost of running steam plant for 24 hours.

![Fig.1](image1)

![Fig.2](image2)

4(a). Enumerate the different types of Excitation Systems? With the help of diagram, explain the operation of a Rotating Thyristor Excitation System. [07]

OR
4(a'). What is the principle of operation of Automatic Voltage Regulators? With the help of a neat sketch, explain the operation of Rotating Amplifier Regulator.

4(b). Write down the different bus bar arrangements used in power stations. Discuss the Duplicate Bus Bar type arrangement.

5(a). Discuss the different types of substations.

5(b). What are the different equipments used in a substation? Discuss the operation and characteristics of a Lightning Arrester.
2018-19
B.E. (AUTUMN SEMESTER) EXAMINATION
ELECTRICAL ENGINEERING
CONTROL SYSTEM
EEE-442N

Maximum Marks: 60 Credit: 04 Duration: Two Hours

Answer the following questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q. No.  Question  M.M.
1. (a). Consider the mechanical system shown in figure (1). Develop a state model for the system by taking \( M_1 = M_2 = 1 \text{kg} \) and \( B = 1 \text{ N-S/m} \) and \( K = 1 \text{ N/m} \).

![Figure 1]

1. (b). Consider the system
\[
\begin{bmatrix}
\dot{x}_1 \\
\dot{x}_2 \\
\dot{x}_3
\end{bmatrix} =
\begin{bmatrix}
0 & 1 & 0 \\
0 & 0 & 1 \\
-6 & -11 & -5
\end{bmatrix}
\begin{bmatrix}
x_1 \\
x_2 \\
x_3
\end{bmatrix} +
\begin{bmatrix}
0 \\
0 \\
3
\end{bmatrix} u
\]

Examine the controllability of the system using the controllability matrix.

OR

1'(a). Consider a system:
\[
\begin{bmatrix}
\dot{x}_1 \\
\dot{x}_2
\end{bmatrix} =
\begin{bmatrix}
0 & 0 \\
-1 & -2
\end{bmatrix}
\begin{bmatrix}
x_1 \\
x_2
\end{bmatrix} +
\begin{bmatrix}
1 \\
-1
\end{bmatrix} u
\]

and
\[
y = \begin{bmatrix} 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}, \quad x(0) = \begin{bmatrix} 0 \\ 1 \end{bmatrix}
\]

Compute
(i) State Transition matrix
(ii) Solution of the equation

contd...
1(b). Develop the state model by using phase variable representation for the system with the following transfer function:

\[ T(s) = \frac{2}{s^3 + 6s^2 + 11s + 6} \]

2 (a). A continuous non-periodic signal \( x(t) \) is sampled and fed to digital controller. Show that for complete reconstruction of the spectrum \( x(f) \) of signal \( x(t) \), the sampling frequency must be greater than twice the maximum frequency component present in \( x(f) \).

2 (b). A system \( T(s) = \frac{s+4}{s+5} \) is cascaded with the zero-order hold. Find out the transfer function \( T(z) \) of the system.

OR

2' (a). In a digital control system of figure 2, if the sampled input:

\[ R^*(s) = \frac{1}{T} \sum_{n=-\infty}^{\infty} R(s + jn\omega) \]

show that sampled output \( Y^*(s) = R^*(s)G^*(s) \)

![Block Diagram]

Figure 2

2' (b). For the following system, find \( f(kT) \) using power series expansion

\[ F(z) = \frac{(z + 3)(z + 5)}{(z - 4)(z - 6)(z - 8)} \]

3 (a) Characteristic equation of a discrete system is given by:

\[ D(z) = z^2 - 0.2z + 0.1 = 0 \]

Evaluate its stability using

i. \( r \)-transformation method

ii. Jury’s Table method

3 (b) Show that a discrete system with transfer function \( G(z) \) is stable if all of its poles lie inside the unit circle of radius unity in \( z \)-plane.

4 (a). A system is specified by
\[ \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 4 \\ -1 & -1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 3 \end{bmatrix} u \]

Determine the state feedback matrix as closed loop poles are placed at \( s = -2, -4, \) and \(-6\).

4 (b). Discuss the difference between output feedback and state feedback. [04]  

OR  

4'(a). Consider the system \( \dot{x} = Ax + Bu \) and \( y = Cx \), where  

\[ A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \quad \text{and} \quad C = [1 \quad 0 \quad 0] \]

Design a minimum observer matrix, assuming that the desired Eigen’s value are: \( \mu_1 = -2 + j2\sqrt{3} \) and \( \mu_2 = -2 - j2\sqrt{3} \)

4'(b). Briefly explain the pole placement design technique. [04]

5 (a). Draw the characteristics of a relay with dead zone and find its describing function. [08]

5 (b). With the help of example distinguish between:

(i) Incidental and Non-Incidental non-linearity  
(ii) Positive and Negative semi definite function
2018-2019
B. E. (AUTUMN SEMESTER) EXAMINATION
(ELECTRICAL ENGINEERING)
MICROPROCESSOR SYSTEMS AND APPLICATIONS
(EEE-473)
Maximum Marks: 60 Credit: 04 Duration: Two Hours

NOTE: i) Answer any TWO parts from each question.
   ii) Every part carries equal marks.

1. (a) Write the functions of the following pins of 8085 microprocessor:
   (i) SI0 & SO0 (ii) IN1A (iii) CLK(OUT) (iv) S1 & S0
   (b) Explain the functions of the following instructions of 8085 microprocessor:
   (i) PUSH PSW (ii) RLC (iii) NOP
   (c) Draw the timing diagram of Opcode fetch machine cycle. Assume that
   opcode 80H is stored at a memory location 2056H.
   6

2. (a) Explain the address decoding for a memory chip of 4096 bytes.
   (b) Give the format of ICW1 for 8259.
   (c) Explain the following signals of 8257 DMA Controller.
   (i) HRQ (ii) AEN (iii) DACK'
   6

3 (a) Specify the handshake signals and their functions if port A of 8255 is set up
      as an input port in Mode 1.
   (b) Explain the working of 8254 when it is working as:
       (i) Rate Generator
       (ii) Square-Wave Generator
   (c) List the components and describe their functions when Successive-
       Approximation A/D converter is used as an Integrated Circuit.
   6

4. (a) Draw the block diagram of Intel 8086 microprocessor.
   (b) Describe the memory organization in 8086 microprocessor.
   (c) How will you differentiate between status flag and control flag in 8086
       microprocessor? List and explain those status flags of 8086 microprocessor
       which are not compatible with 8085 microprocessor.
   6

5. (a) Explain the following Assembler Directives:
   (i) ORG 3000 (ii) DW 2070 (iii) DB
   (b) Explain the functions of the following instructions of 8086 microprocessor:
   (i) AAA (ii) AAS (iii) ADC des, src
   (c) Explain the following hardware interrupt pins of 8086 microprocessor.
   (i) INTR (ii) NMI
   6