M. Tech. 3rd Semester (EEE)

Examination, December-2025

PLC CONTROLLER AND THEIR APPLICATIONS

Paper : MTEEE-601

Time allowed : 3 Hours]   *[Maximum marks : 100*

Note : Attempt any five questions in all, all question carry equal marks.

Unit-I

1. Explain the basic architecture of a PLC system with a neat block diagram. Discuss CPU I/O modules, Interfacing and devices connected to them.   20

2. Discuss the construction of a PLC ladder diagram. Write a program to control a lamp that glows only when two push buttons are pressed simultaneously.   20

Unit-II

3. Discuss ladder diagrams for process control. With a neat diagram, prepare the sequence listing and flow chart for an automatic water filling system controlled by a PLC.   20

4. Explain the working of basic digital logic gates (AND,OR,NOT,NAND,NOR,XOR,XNOR) write the truth table for each. Using Boolean algebra, design a PLC ladder logic to implement the function. $Y = AB+A'C$ 20

Unit-III

5. Differentiate between Timer functions, Counter functions, and Data Handling Functions in PLCs. Discuss their industrial importance with examples.   20

6. Define a PLC counter. Explain the operation of UP counter and DOWN counter with neat ladder diagram. Mention at least two industrial applications of counters.   20

Unit-IV

7. A motor is required to run at 1500 RPM. A PID controller has Kp = 2, Ti = 1 sec, Td = 0.2 sec. If the error at a certain instant is 100 RPM.
    Write the PID equation.
    Calculate the control output.   20

8. Discuss how PLCs can control two-axis and three-axis robots. Draw suitable diagrams and explain step sequencing required for robotic movement. Mention any two real-world robotic applications.
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PROCESS CONTROL

Paper : MTEEE-603

Time allowed : 3 Hours]   *[Maximum marks : 100*

Note : *Student have to attempt any* *five* *questions in total.*
All question carry equal marks.

1.   (a)   What is offset in process control and how it can be analyzed?

      (b)   What is degree of freedom? Write down its various features and importance.

2.   Write about :

      (a)   Computer simulation

      (b)   Linearization of non linear system transfer function.

3.   Describe :

      (a)   Process reaction curve

      (b)   Frequency response characteristic

4.   Write a note on :

      a)   Dead time compensator

      (b)   Inverse response compensator.

5.   (a)   Write about Multivariable system & multivariable turning technique.

   (b)   What is over ride control?

6.   Write a note on :

   (a)   Interaction of control loops.

   (b)   Design of non-interaction control loop.

7.   Write about :

   (a)   Optimal control of processes

   (b)   Adaptive control of processes

8.   (a)   Write a note on online tuning, process control languages and application packages.

   (b)   Operating system for real-time process control.

M. Tech. 3rd Semester (EEE)

Examination, December-2025

HVDC TRANSMISSION

Paper : MTEEE-615

Time allowed : 3 Hours] [*Maximum marks : 100*

Note : Attempt five questions in all. All questions carry equal marks.

1. (a) Describe the power handling capability of HVDC lines compared to HVAC systems. 10

   (b) A ±400 kV, 1500 MW HVDC link is transmitting power over 800 km. Compute the current in each pole and total line losses if resistance per conductor is 0.075 Ω/km. 10

2. (a) Draw and explain the equivalent circuit of a 12-pulse converter. 10

   (b) Discuss the special features and design considerations of converter transformers used in HVDC stations. 10

3. (a) What are the methods for harmonic elimination in HVDC systems? 10

   (b) Explain the design of a DC harmonic filter to eliminate the 12th harmonic with appropriate calculation. 10

4. (a) Compare constant current control and constant ignition angle control in HVDC systems. 10

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(b) Describe individual phase control in HVDC converter with timing diagram.   10

5. (a) Explain the problem of harmonic instability in AC-DC interconnected systems.   10

(b) Analyze the impact of HVDC on voltage profile and stability of connected HVAC systems with an example.   10

6. (a) Describe the operation of series-parallel multi-terminal HVDC systems with suitable diagrams.   10

(b) Explain how control is coordinated in a multi-terminal HVDC system with three terminals.   10

7. (a) Discuss the various types of overvoltages that can occur in an HVDC system.   10

(b) A surge due to a lightning strike causes an overvoltage of 1.2 pu on the AC side. Discuss its effect on the converter and how it is mitigated.   10

8. (a) Explain the role of valve group protection in HVDC systems.   10

(b) Describe the working of DC line protection using current differential method. Incl∶ e relevant line protection schemes.   10

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P. G. Open Elective Course 3rd Semester Under CBCS (Only Re-Appear Pre-NEP) Examination – December, 2025

SOURCES OF ENERGY-II

Paper : 16PHY02

Time : Three Hours]   [Maximum Marks : 80

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) Discuss the availability of biomass in India.   4

     (b) Write down the disadvantages of harnessing tidal energy for power generation.   4

     (c) Write a short note on formation of coal.   4

(d) Describe the principle on which hydrogen bomb works. 4

UNIT – I

2. (a) What is biomass ? Discuss the types of biomass resources. 6

(b) Explain the different phases and processes involved in anaerobic digestion. 10

3. (a) Describe various factors that control the yield of biogas. 6

(b) Explain the constructional details and working of KVIC model biogas plant. 10

UNIT – II

4. Describe the principle of wave formation. Discuss different methods of harnessing the wave energy. 16

5. (a) Draw the schematic diagram and explain the open cycle ocean thermal energy conversion (OTEC) system. 10

(b) Enumerate the applications of OTEC systems. 6

UNIT – III

6. With a neat sketch, discuss the construction and working of a coal based power plant for electricity generation. Write down its advantages. 16

7. (a) Write notes on : 9

(i) Natural gas

(ii) LPG

(iii) Octane number

(b) Explain the process of extraction of petroleum. 7

UNIT – IV

8. Explain the principle, construction and working of a fast breeder nuclear reactor. 16

9. (a) Define the term : Isotopes, Isobars, binding energy and mass defect. 4

(b) Classify different types of nuclear reactions with examples of each. Describe proton-proton cycle. 12

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