Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 40842

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Sixth/Seventh Semester

Mechanical Engineering

ME 8791 — MECHATRONICS

(Common to Manufacturing Engineering / Mechanical Engineering (Sandwich) / Mechanical and Automation Engineering / Production Engineering)

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the key elements of mechatronics?

2. State the purpose of using potentiometer in displacement sensor.

3. What are the functions of accumulator register?

4. How many machine cycles does 8085 have, mention them?

5. What are the operating modes of port A of 8255?

6. What are the ADC and DAC specifications?

7. Write short notes on: ON delay/OFF delay timer.

8. What is interlocking in ladder logic?

9. Define detent torque.

10. How can servo motor be controlled?

PART B — (5 × 13 = 65 marks)

11. (a) Explain in detail the static and dynamic characteristics of a sensor.

Or

(b) Describe performance characteristics of an LVDT and explain eddy current transducer for measurement of linear displacement.

12. (a) Explain with timing diagram the memory read cycle in 8085.

Or

(b) How many interrupt sources are available in 8051? Explain in detail.

13. (a) Interface a 4 digit seven segment display with 8255 and write an ALP to display rotating '2012'.

Or

(b) How do you interface a stepper motor to a controller? Give the necessary hardware and software functional blocks.

14. (a) Draw a ladder diagram for two motor system having following conditions:

   (i)   Starting push button starts motor 1

   (ii) After 10 seconds, motor – 2 is ON

   (iii) Stopping the switch stops motor 1 and 2 (Time base 1 sec).

Or

(b) Develop the ladder logic to fill the tank.

   (i)   Fill the tank up to 80%. When the tank is filled, turn ON the heater to raise the temperature up to 70 deg.

   (ii) When this temperature is reached, turn OFF the heater and open the outlet valve.

   (iii) When the level in the tank falls below 10%, close the output valve.

15. (a) Explain construction and working of a DC servomotor along with its torque-speed characteristics.

Or

(b) Design a pick and place robot using mechatronics elements and explain the same with relevant examples.

PART C — (1 × 15 = 15 marks)

16. (a) With a suitable example explain the 8085 microprocessor interrupt system in detail.

Or

(b) Considering a computer controlled machine tool (CNC machine tool) as a mechatronics system. Discuss the design considerations and design solutions to those considerations.

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Reg. No. :

Question Paper Code : X10711

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
AND APRIL/MAY 2021
Sixth/Seventh Semester
Mechanical Engineering
ME 8791 – MECHATRONICS
(Common to Production Engineering, Mechanical and Automation Engineering,
Manufacturing Engineering and Mechanical Engineering (Sandwich)
(Regulations 2017)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions.

PART – A   (10×2=20 Marks)

1. Define measurement system.

2. Classify the types of potentiometer.

3. Describe the features of 8085.

4. Differentiate machine language and assembly language program.

5. What is the typical use of PPI ?

6. Describe the need of interfacing.

7. Tell the use of JUMP control in PLCs.

8. Draw a ladder diagram for NAND operation.

9. What is the use of PLC in automatic car park system ?

10. Write down the applications of stepper motors.

PART – B   (5×13=65 Marks)

11. a) Describe the concept of LVDT and capacitance sensor.   (13)

       (OR)

    b) Formulate the factors to be considered for the selection of sensor.   (13)

12. a) Explain about architecture of 8085 microprocessor.   (13)

       (OR)

    b) Illustrate various addressing modes of 8051 microcontroller.   (13)

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13. a) Explain the architecture of a 8255 Programmable Peripheral Interface. **(13)**

   (OR)

   b) Explain the concept of interfacing with stepper motor. **(13)**

14. a) Explain the architecture of PLC with neat sketch. **(13)**

   (OR)

   b) Explain the ladder diagram for various logic functions. **(13)**

15. a) List out the specifications of stepper motor and write the advantages and disadvantages. **(13)**

   (OR)

   b) Relate the difference between Traditional and Mechatronics approach with suitable example. **(13)**

<div align="center">PART – C   (1×15=15 Marks)</div>

16. a) Design a PLC circuit that can be used to start a motor and then after a delay of 100s start a pump when the motor is switched off there should a delay of 10s before the pump is switched off. **(15)**

   (OR)

   b) Explain the concept of Car engine management system by mechatronics approach. **(15)**

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Reg. No. :

Question Paper Code : 90374

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Third Semester
Electrical and Electronics Engineering
ME 8792 – POWER PLANT ENGINEERING
(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

State clearly any assumption made with justification
Use of approved steam table is permitted
Answer ALL questions

PART – A (10×2=20 Marks)

1. List any 4 advantages of cleaning of coal.

2. State the principle of Rankine cycle cogeneration.

3. Compare the compression ratio of gasoline engine and diesel engine.

4. Claim any 4 merits of gas turbine over steam turbine.

5. What is the purpose of control rods ?

6. What do you mean by moderating ratio and what is the significance of high value of moderating ratio ?

7. Which kind of solar collectors preferred for solar thermal power plant ? Why ?

8. How wind mill is classified ?

9. What is the need of depreciation cost ?

10. What is plant capacity factor ?

PART – B   (5×13=65 Marks)

11. a) What is binary cycle ? Sketch the schematic of mercury-water based power plant and the corresponding plant T-s diagram. Also explain the working of the plant.

(OR)

b) i) Discuss the merits and demerits of water tube boilers over fire tube boilers.   **(8)**

ii) List the qualities that are required for a good boiler.   **(5)**

12. a) What is dual cycle ? Explain the dual cycle process using PV and TS diagram. Also obtain the efficiency expression for dual cycle.

(OR)

b) i) Draw a schematic of closed gas turbine plant and discuss its function. Also suggest fuels that are especially required for closed cycle gas turbine plant.   **(8)**

ii) Draw a schematic of reheat based gas turbine plant and briefly discuss its function.   **(5)**

13. a) i) Write any 4 merits and demerits each for nuclear power plant.   **(8)**

ii) Write short notes on :   **(5)**
   • Reflector and
   • Biological shielding.

(OR)

b) Name the different components of nuclear reactor and discuss the working of Boiling Water Reactor (BWR).

14. a) i) List the essential elements of hydro-electric power plant.   **(4)**

ii) Highlight the merits of "pumped storage plant".   **(4)**

iii) With relevant sketch explain the function of Pelton turbine.   **(5)**

(OR)

b) What is Fuel cell ? Why Fuel cells for power generation ? Also discuss the working principle of fuel cell.

15. a) Discuss the reason and effects of air pollution and water pollution due to thermal power plants.

(OR)

b) A new power plant is desired to install and for which discuss the detailed cost analysis.

PART – C   (1×15=15 Marks)

16. a) The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg.
   (i) Determine the pressure and temperatures at all points of the Otto cycle.
   (ii) Also calculate the specific work and thermal efficiency of the cycle for a compression ratio of 8 : 1. Take for air $C_v = 0.72$ kJ/(kg-K) and specific heat ratio is 1.4.

(OR)

b) i) A hydro power plant is to be used as peak load plant at an annual load factor of 30%. The electrical energy obtained during the year is 750×10^5 kWh. Determine the maximum demand. If the plant capacity factor is 24% find reserve capacity of the plant.   **(7)**

ii) A steam power station has an installed capacity of 120 MW and a maximum demand of 100 MW. The coal consumption is 0.4 kg per kWh and cost of coal is Rs. 80 per tonne. The annual expenses on salary bill of staff and other overhead charges excluding cost of coal are Rs. 50×10^5. The power station works at a load factor of 0.5 and the capital cost of the power station is Rs. 4×10^5. If the rate of interest and depreciation is 10% determine the cost of generating per kWh.   **(8)**