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Uni. Roll No. ...............

Program: B.Tech. (Batch 2018 onward)

EVENING

Semester:.6th.

1 3 JUN 2023

Name of Subject: PLC and Industrial Drives

Subject Code: ) PCEE-115.

Paper ID: 17227

Scientific calculator is Allowed

Time Allowed: 03 Hours

Max. Marks: 60

**NOTE:**

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

### Part – A

[Marks: 02 each]

**Q1.**

a) What is meant by " rating of motor"?

b) Give two differences between relay logic and ladder logic.

c) Define the following terms w.r.t. PLC

   i. Scan time.

   ii. Speed of execution.

d) Write the function of power modulator in electric drive.

e) Inference the factors required for the selection of electric drive.

f) Develop the ladder logic for the following functions

   i. NOR gate

   ii. NAND gate

### Part – B

[Marks: 04 each]

**Q2.** Discuss the four quadrant operation of electric drive in detail.

**Q3.** Explain the load equalization for fluctuated loads in electric drive.

**Q4.** Elucidate the basic operation and principle of a PLC.

**Q5.** Mention the different types of classes of motor duty and explain them in brief.

**Q6.** Formulate a ladder logic for traffic control whose sequence is as under (using Zelio ladder programming language only)

    i. We have to control the traffic of 4 roads.

    ii. The green light of each side is ON for 10 seconds only one side at a time and at the same time, the respected red light is ON for 30 seconds.

    iii. The same sequence is followed for each side.

**Q7.** Determine the methods of speed control for induction motor and explain them in detail.

<div align="center"><b>Part – C</b>          <b>[Marks: 12 each]</b></div>

**Q8.** Draw the block diagram of a PLC and also explain the fuction of each building block in detail.

<div align="center">OR</div>

Build and explain the block diagram of a electric drive and also give four applications of electric drive.

**Q9.** Explain the thermal modelling of a motor.

A 220V, 1000rpm, 60A separately excited dc motor is fed from a single phase fully controlled rectifier with an alternating source of 230V, 50 Hz, $R_a = 0.1\Omega$. Conduction can be assumed to be continuous. Calculate the firing angle for rated motor torque at(600) rpm, Firing angle for rated motor torque at (-500) rpm and finally also find motor speed for firing angle 150 and half rated torque.

<div align="center">OR</div>

Write a short note on the following

    i. Regenerative braking in electric drives.

    ii. Vector control of electric drive.

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