



Tertiary and Vocational Education Commission
Electrical Technology- Part I
NCT Equivalence Examination



Instructions:

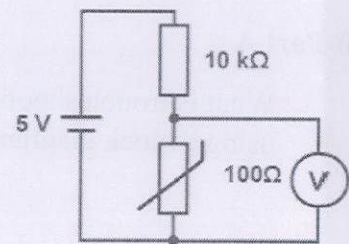
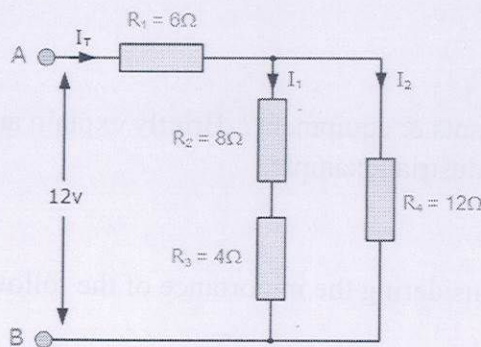
Duration – 03 Hrs.

01. This paper consist **Five (05)** questions.
02. Each question has **Part A** and **Part B**.
03. Answer only **One Part (Part A or Part B)** of each question.

1.0 Part - A

- I. In the following circuit calculate the total current (I_T) taken from the 12v supply.

(4 Marks)



- II. In the example above a 10K resistor (R_1) is connected in series with a thermistor (R_2) to create a voltage divider. The total voltage across both components is 5.0V. When the thermistor is placed in a warm environment it has a resistance of 100Ω. Calculate the voltage across the thermistor under these conditions.
- III. The input power to a 3-phase AC motor is measured as 5kW. If the voltage and current to the motor are 400V and 8.6A respectively, determine the power factor of the system?
- IV. A 415V, 3-phase AC. motor has a power output of 12.75kW and operates at a power factor of 0.77 lagging and with an efficiency of 85 per cent. If the motor is delta-connected, determine (a) the power input, (b) the line current and (c) the phase current.

(4 Marks)

(6 Marks)

(6 Marks)

1.0 Part B

I

- (a) Draw the internal circuit of solid-state relay (S.S.R) and explain the function through and application. (4 Marks)
- (b) Draw the symbol of FET transistor and explain its function (4 Marks)

II

- (a) Name the Basic logic gates, Universal logic gate, Other logic gate and draw the IEC symbols (4 Marks)
- (b) Write through tables of above mention logic gates (3 Marks)
- (c) Draw a Logic Circuits using following Boolean Algebra. (3 Marks)

$$ABC + \bar{A}BD + \bar{B}\bar{C}D$$

- (d) What is Pull-Up and Pull-Down Resistor and draw a neat sketch with one application (2 Marks)

2.0 Part A

- I What is troubleshooting of industrial plants & equipment?. Briefly explain an example using a block diagram of a particular industrial example. (4 Marks)

- II Provide two examples of each topic, considering the importance of the following list for industry.

- a) Block Diagram
- b) Schematic circuit diagram
- c) Fault diagnostic
- d) Previous fault locations
- e) Risk assessment
- f) LOTO function
- g) SOP
- h) OEM

(8 Marks)

- III (a) Describe, troubleshooting steps when the motor suddenly stopped, the Star and Delta motor starter connected with a three-phase motor. (2 Marks)
- (b) Draw a step diagram of troubleshooting (2 Marks)
- (c) Mention five things while you to inspect the system (2 Marks)
- (d) Briefly explain the relay interlocking and mechanical interlocking (2 Marks)

2.0 Part B

- I Describe the importance of Electrical Regulations that must be required for electrical installation and explain through applications (4 Marks)
- II What is Workface Planning (WFP)? Briefly explain through an electrical installation project. (4 Marks)
- III Briefly explain the difference between Hardware and Software (2 Marks)
- IV Briefly explain the Firmware and BIOS with examples (4 Marks)
- V Briefly explain the (OS) requirement of Operating System and list most popular five OS in the world (2 Marks)
- VI What are the industrial networking protocols? (4 Marks)

3.0 Part A

- I What applications are included in Microsoft Office package? (4 Marks)
- II What are the storage devices? And mention 05 storage devices in computer environment (2 Marks)
- III What is Cloud Storage and advantage? And provide 02 examples (4 Marks)
- IV What is Process Documentation? It includes all types of documents that support a process, and list types of documents through the examples. (4 Marks)
- V Explain the importance of documentation procedures and methods to workplace. (3 Marks)
- VI What is the Mail merge? (3 Marks)

3.0 Part B

- I What are the Forecasting Techniques? Briefly explain through the examples in working environment. (4 Marks)
- II What is Data Collection? Why Should You Collect Data? Provide examples from your working environment. (4 Marks)
- III Defines the Project Management Method (2 Marks)
- IV Why team work is important for workplace (2 Marks)

- V Briefly explain Importance of networking in day-to-day activities of the organization. (4 Marks)
- IV Briefly explain Importance of ICT tools in promoting the efficiency and effectiveness of the organization. (4 Marks)

4.0 Part A

- I Calculate the capacitive reactance value of a 220 nF, capacitor at a frequency of 1 kHz and again at a frequency of 20 kHz. (3 Marks)
- II Calculate the inductive reactance of a 3.00 mH inductor when 60.0 Hz and 10.0 kHz AC voltages are applied. (b) What is the rms current at each frequency if the applied rms voltage is 120 V? (3 Marks)
- III Calculate the capacitive reactance of a 5.00 mF capacitor when 60.0 Hz and 10.0 kHz AC voltages are applied. (b) What is the rms current if the applied rms voltage is 120 V? (4 Marks)
- IV Draw a sketch of an alternator and draw the three-phase waveform write the relevant names. (4 Marks)
- V Draw an AC waveform of peak-to-peak and mention relevant formula in relation to peak-to-peak and RMS. (4 Marks)
- IV Find the peak voltage if the RMS voltage is 85 V. (2 Marks)

4.0 Part B

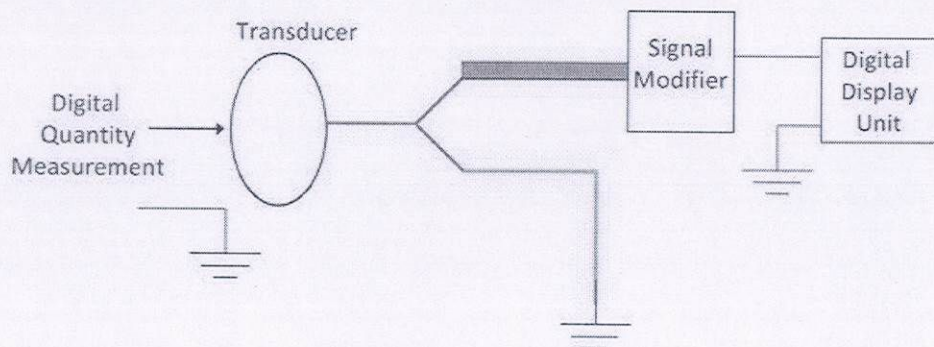
- i. Describe Sequential Logic Operation (4 Marks)
- ii. Describe Functions of Operational Amplifier with relevant illustrations (4 Marks)
- iii. Draw circuits, open and closed loop of Operational Amplifier and briefly explain the both functions (4 Marks)
- i. Briefly, explain the function and importance of opto-electronics and draw an opto-coupler symbol (4 Marks)
- ii. What is the difference between a Linear Power Supply and a Switched Mode Power Supply? Briefly explain both functions and provide necessary illustrations (4 Marks)

5.0 Part A

- I What is the earth fault and short circuit? And briefly explain with examples, provide necessary sketches. (4 Marks)
- II What is the RCBO? And explain why is important it (2 Marks)
- III What is the importance of Residual Current Circuit Breaker (RCCB)? And draw an internal diagram and explain shortly (2 Marks)
- IV What are the deferent between MCB and MCCB? (2 Marks)
- V Why induction motor takes high current when starting and draw current vs time graph. (2 Marks)
- VI What is the difference between brush type motor and brushless motors. Explain briefly and provide necessary examples through the illustrations. (4 Marks)
- VII What is the deferent between relay and contactor? (2 Marks)
- VIII Briefly explain the basic function of servo motor and how to control it. (2 Marks)

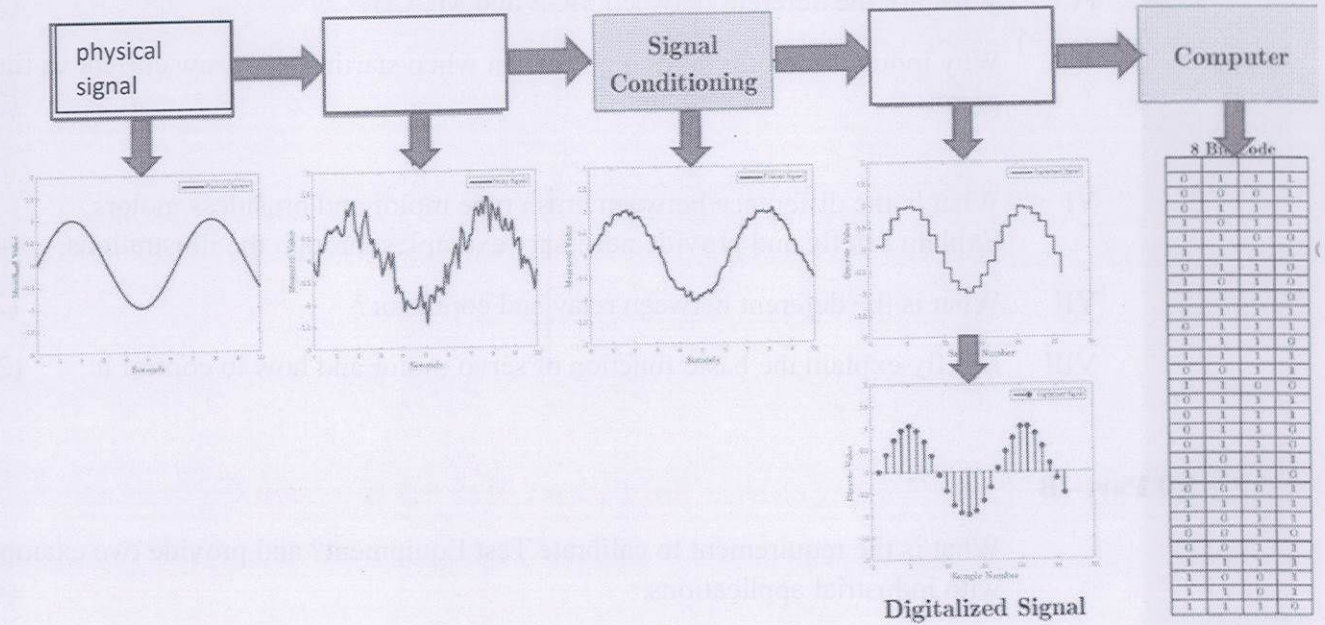
5.0 Part - B

- I What is the requirement to calibrate Test Equipment? and provide two examples with industrial applications. (4 Marks)
- II Name and explain instrument transformer types. What are the benefits and Provide necessary Sketches? (4 Marks)
- III List and draw types of waveforms (4 Marks)
- IV What do you think about the bellow illustration and explain shortly through the Industrial application. (4 Marks)



Data acquisition is the process of sampling signals that measure real-world physical conditions and converting the resulting samples into digital numeric values that can be manipulated by a computer.

Digital Data Acquisition System



V Briefly explain the process of above block diagram according to the digital instrumentation application. What do you think the given physical signal and digitalized signal as well as computer? (4 Marks)