CHRISTIAN SOCIAL SERVICE COMMISION (CSSC)

NORTHERN ZONE JOINT EXAMINATION SYNDICATE (NZJES)

FORM FOUR PRE NATIONAL EXAMINATION 2024

CODE: 082 ELECTRICAL ENGINEERING SCIENCE. TIME: 3HOURS

INSTRUCTIONS

1. This paper consists of sections A, B and C with a total of 11 questions
2. Answer all questions in sections A and B and any TWO (2) questions from section C
3. All working for each question should be shown clearly
4. Calculators and all communication devices are not allowed in examination room
5. Write your index number on every page of your booklet(s)
6. Whenever necessary use the following constant
   (i) Temperature coefficient of copper = $0.004\Omega/^0C$
   (ii) 1 Horsepower = 0.75KW
   (iii) $1\Omega = 1{,}000{,}000\mu\Omega$

SECTION A (16 Marks)

1. For each of the items (i) – (x) choose the most correct answer from among the given alternatives and write its letter in the answer sheets provided.

(i) Which quantity is measured in farad as the nature and behaviors of electrical quantities are considered?
   A. Reactance C. Impedance E. Resistance
   B. Inductance D. Capacitance

(ii) A transformer having 1000 primary turns is connected to 250V A.C supply. If the Secondary voltage is 400V, what is the number of turns in the secondary side?
   A. 1700 B. 1800 C. 1600 D. 1650 E. 1550

(iii) How are the transformer laminations insulated from each other?
   A. By mica strip D. By P.V.C
   B. By thin coat of vanish E. By rubber insulation
   C. By glass

(iv) Which of the following devices apply magnetic effect to operate
   A. Fuse B. Cell C. Bell D. Toaster E. Cooker

(v) Which one can cause accidents in an electrical workshop?
   A. Wearing goggles D. Wearing loose sleeve shirt
   B. Sweeping the floor E. Using wooden chairs
   C. Large working space

(vi) Which statement is true about the purpose of the commutator in D.C machine?
A. It takes away generated voltage
B. It convert output current to voltage
C. It convert D.C voltage to A.C Voltage
D. It rectifies A.C voltage to D.C voltage
E. It convert A.D current to D.C current

(vii) Where is appropriate to use wattmeter for measuring process?
A. In measuring apparent power
B. In measuring true power
C. In measuring reactive power
D. In measuring average power
E. In measuring estimated power

(viii) What will happen in an induction motor if the air gap is increased?
A. Bearing friction will increases
B. Windage losses will be more
C. Copper loss will be reduced
D. The power factor will be low
E. The power input will be more

(ix) Which of the following are the Main effects of an electrical current?
A. Magnetic, electromagnetic and electricity
B. Chemical, magnetic and boiling
C. Heating, repelling and attracting
D. Magnetic, heating and electric
E. Heating, chemical and magnetic

(x) Why are electrical appliances connected in parallel?
A. Parallel circuit is simple in connection and economical
B. Appliances drew higher current and power
C. Appliances drew higher current and less resistance
D. Appliances in parallel reduces power loss and cost
E. The operations of appliance is independent of each other.

(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)

2. Match the items in List A with those in List B by writing a letter of a correct responses below the corresponding item numbers in the box provided.

LIST A		LIST B
(I)	It drives the flux through a magnetic circuit and corresponds to electromotive force in an electric circuit	A. Resistance B. Resistivity C. Reluctance D. Magneto motive force E. Conductance F. Ampere turns G. Permeance H. Reluctivity
(II)	Is the unit of Magneto motive force (mmf)	
(III)	Is the name given to that property of material which opposes the creation of magnetic flux in it	
(IV)	It is the reciprocal of reluctance and implies the case with which magnetic flux is develop.	
(V)	It is a specific reluctance and corresponds to resistivity which is specific resistance	
(VI)	It is the reciprocal of resistance of a given wire	

SECTION B (54Marks)

3. (a) Draw electrical symbol of air cored transformer
   (b) (i) Briefly explain the meaning of "Voltage regulation" in transformer
   (ii) Name two losses which occur in a transformer
   (c) Calculate the efficiency of a transformer with an input and output of 2kw and 1.9kw respectively

4. (a) Briefly explain how you can extend the range of;
   (i) An ammeter
   (ii) A voltameter

   (b) A moving coil instrument gives full scale deflection with 15MA and has a resistance of 5Ω. Calculate the resistance required to enable the instrument to read up to:

   (i) 1A in parallel connection

   (ii) 10V in series connection

5. (a) Define the following terms as used in cells and batteries
   (i) Polarization
   (ii) Local action

(b) A battery of emf 40V and internal resistance 5Ω is connected to a resistance of 15Ω calculate the terminal potential difference

6. (a) Define two units of electrical energy.
   (b) The heat energy developed in a wire is proportional to three factors. What are these factors?
   (c) Define "Hot wire ammeter"

7. In a practical work, four resistors of 9Ω, 2Ω, 6Ω and 3Ω are given. You are required to connect 6Ω and 2Ω in series and also 9Ω and 3Ω resistor in series. As a result series one is connected in parallel with series two across a battery of 24V.
   (a) Draw an electric circuit to show the above information
   (b) Calculate the power dissipated for each series

8. (a) State three factors which influence the force on current carrying conductor.
   (b. Briefly state the two lows of magnetism
   (c) Determine the resistance of copper at 50^0C if its resistance at 0^0C is 10Ω.

SECTION C. (30Marks)

Answer any two questions

9. (a) Name three parameters of A.C circuit. State the specific SI unit for each parameter
   b) Enumerate three types of A.C power. Give the formula and SI unit of each type
   c) A coil of inductance 0.4H is connected in parallel with a $10\mu f$ capacitor across a 240V, 50HZ supply.
   i) Draw a circuit diagram for the above information
   ii) Calculate the supply current

10. (a) State two laws of illumination
    b) Define the following terms as applied in illumination
    i) Maintenance factor
    ii) Coefficient of utilization
    iii Depreciation factor
    c). A small supper market 20m long by 15m wide is to be illuminated to a level of 600 lux by 2400mm 125W fluorescent lamps having an efficacy of 65/M/W. The maintenance factor is 0.85 and the coefficient of utilization is 0.6, calculate the number of fittings required.

11. (a) State two methods used for interconnection of three phase system.
    (b) Power in a three phase system may be measured using one more wattmeter's. Name three methods available for the measurement of three phase power using wattmeter's.
    (c) Three coils have an inductive reactance of 25Ω and resistance of 15Ω each are start connected. Calculate the total power if the network is supplied from a three phase supply of line voltage of 415V.