KATHMANDU UNIVERSITY
End Semester Examination
March, 2024

Marks Scored:

Level : B.E.
Year : II

Course : MNEG 202
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 21 MAR 2025

SECTION "A"
[20Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate answer.

1. Kirchhoff's current law is applicable only to:
   a. Electric circuits
   b. Electronic circuits
   c. Closed loops in a network
   d. Junctions in a network

2. If 125 V is applied across a 250 V, 100 W bulb, the power consumption will be:
   a. 100 W
   b. 50 W
   c. 25 W
   d. 12.5 W

3. Three resistances of value R ohms each are connected in star. Its equivalent delta will comprise three resistances of value:
   a. R/3
   b. 3R each
   c. R each
   d. 3R, R, R/3

4. The direction of current in A.C. circuit is:
   a. Always in one direction
   b. Varying from time to time
   c. Unpredictable
   d. From positive to negative

5. In a three-phase system, the emf's are:
   a. 30^0 apart
   b. 40^0 apart
   c. 90^0 apart
   d. 120^0 apart

6. A transformer steps up the voltage by a factor of 100. The ratio of current in the primary to that in the secondary is:
   a. 1
   b. 100
   c. 0.01
   d. 0.1

7. The copper loss of certain transformer at half full-load is measured as 400 W. Then, the copper loss at full-load will be:
   a. 800 W
   b. 200 W
   c. 400 W
   d. 1,600 W

8. Series motors have:
   a. a relatively high starting torque
   b. medium starting torque
   c. low starting torque
   d. zero starting torque

9. In a d.c. motor, the current is injected to the armature through:
   a. commutator and brushes
   b. slip rings and brushes
   c. solid connections
   d. helical springs

10. The three-phase supply in a three-phase induction motor is connected to:
    a. The rotor windings only.
    b. The stator windings only.
    c. Both the stator and rotor windings.
    d. The stator winding; while a d.c. supply is connected to the rotor winding.

11. Three-phase induction motors are widely used in industries, because
    a. They can be manufactured easily for any H.P. rating.
    b. Their speed can be controlled easily over a wide range.
    c. They are less expensive, rugged in construction and require less maintenance than other motors.
    d. They possess superior operating characteristics over the other motors.

12. Which of the following is not a type of electrical braking of motors?
    a. Regenerative braking
    b. Dynamic braking
    c. Plugging
    d. Hydraulic braking

13. Electrical appliances are connected in parallel, because it:
    a. is a simple circuit.
    b. draws less current.
    c. makes the operation of appliances independent of one another.
    d. results in reduces power loss.

14. Which of the following is not a type of power distribution system used in mining?
    a. Radial system
    b. Primary selective system
    c. Vertical Rising Mains
    d. Primary loop system

15. The voltage drop in a doubly fed distributor is_____ the equivalent singly fed distributor.
    a. less than
    b. more than
    c. equal to
    d. independent of

16. The protection circuit of the household circuit that trips if someone receives a shock is a:
    a. MCCB b. MCB c. Fuse d. ELCB

17. A fuse is inserted in:
    a. A phase wire
    b. Neutral wire
    c. Earth continuity conductor
    d. Phase and neutral wire simultaneously

18. Earthing of an electrical appliance is done to:
    a. Ensure proper working of appliance.
    b. Provide safety against electric shock.
    c. Ensure that the appliance gets full voltage.
    d. Ensure that the appliance gets full power.

19. The utilization factor will be always_____ .
    a. ≥ 1 b. $= 1$ c. < 1 d. ≤ 0

20. The unit of illumination is:
    a. ampere b. lumens c. lux d. candela

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Level : B.E.
Year : II
Time : 2 hrs. 30mins.

21 MAR 2025

Course : MNEG 202
Semester : I
F. M. : 40

SECTION "B"
[5Q. × 8 = 40 marks]

Attempt ANY FIVE questions. Assume suitable data if necessary.

1.

a. Define the concept of Ohm's law. Explain with an example how it is applicable in electric circuits. What are its limitations? [2+1+1]

b. A network is constructed from a series connection of five resistors having values 1Ω, 3Ω, 5Ω, 7Ω, and 9Ω. If 9V is connected across the terminals of the network, employ voltage division to calculate the voltage across the 3Ω resistor. Also, calculate the power dissipated by 7Ω resistor. [2+2]

2.

a. Starting with a simple KCL equation, determine the voltage of node 1 and node 2 relative to the reference node for the circuit shown in fig. 1. [4]

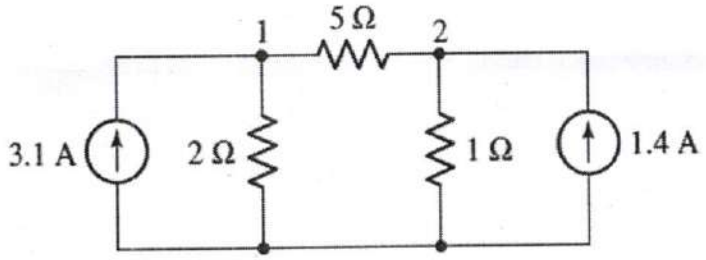

Fig. 1

b. Calculate the average and effective value of the sinusoidal waveform shown in fig. 2. [4]

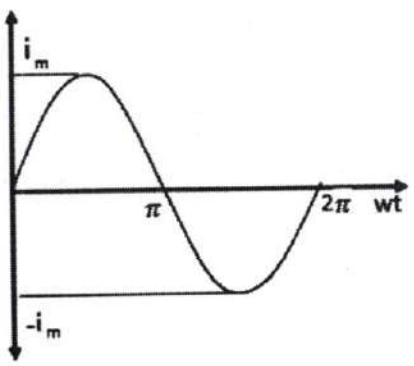

Fig. 2

P.T.O.

3.

a. Calculate the efficiency at half-full load of a 100kVA transformer for p.f. of unity. The copper loss is 1,000W at full load and iron loss is 1,000W. Give reason why the magnetic core of a transformer is laminated? [3+1]

b. Explain in detail various types of dc motors used in today's industrial sector. [4]

4.

a. Explain the working principle of 3-phase induction motor. Give some industrial uses of 3-phase induction motors in mining applications. [3+1]

b. What is a contactor? Explain the working principle of a simple N.O. contactor? [4]

5.

a. Define Earthing? What are the qualities of a good earthing design? Explain how earthing provides an alternative path for the fault current. [1+2+1]

b. You have been assigned the task of designing an illumination system for an underground coal mine industry having dimensions 400 meters in length, 20 meters in width, and 5 meters in height. Develop a lighting design plan including a layout plan if the recommended illumination level for such a workspace is 50 lux. The data required for the design are tabulated as below:

Area to be illuminated	400m × 20m × 5m
Required illumination level	50 lux
Utilization factor	0.6
Maintenance factor	0.8
Luminous efficacy of LED lamps	120 lumens per watt
Power rating of each LED fixture	35 watts

Use appropriate diagrams and calculations to justify your design choices. [4]

6. Write short notes on: [4×2]

a. Braking of rotating machines
b. Cable selection for power distribution
c. Touch and step potential
d. Laws of illumination