KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Marks Scored:

Level : B.Arch.
Year : III
Course : EEEG 331
Semester : II
Exam Roll No. :
Time: 30 mins.
F. M. : 10
Date : 24 FEB 2025
Registration No.:

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate option from each set of choices

1. Which of the following is an example of a short circuit?
   a. A circuit with a very high resistance
   b. A circuit where the current follows its expected path
   c. A circuit where the current takes an unintended low-resistance path
   d. A circuit with no current flow

2. What is the power factor of a circuit?
   a. The ratio of real power to apparent power
   b. The ratio of real power to reactive power
   c. The ratio of reactive power to apparent power
   d. The ratio of resistance to reactance

3. Which of the following is typically NOT a part of the general layout of an electrical transmission and distribution system?
   a. Generating stations
   b. Transformers
   c. Electric meters
   d. Lighting fixtures

4. A 200-watt LED lamp is used for 6 hours daily in a commercial space. The electricity rate is Rs. 10 per kilowatt-hour. The monthly cost of using this lamp is _____
   a. 120 b. 360 c. 3600 d. 1200

5. Which type of lighting system would be most appropriate for an office space?
   a. Ambient lighting b. Accent lighting c. Task lighting d. Decorative lighting

6. A 60-watt incandescent lamp is replaced by a 12-watt LED lamp. If both lamps are used for 8 hours per day, calculate the energy savings per month (30 days).
   a. 14.4 kWh b. 11.5 kWh c. 17.2 kWh d. 2.8 kWh

7. Lux is unit of which physical quantity.
   a. Luminous Intensity
   b. Luminance
   c. Irradiance
   d. Illumination

8. Which of the following lighting systems directs more than 90% of the total light flux onto the working plane using reflectors?
   a. Direct b. Indirect c. Semi-direct d. Diffuse

9. The lightning strikes, power surges, or faulty equipment are the causes of _____ fault type?
   a. Under voltage b. Over voltage c. Ground d. Open circuit

10. What does the term "sizing of conductor" refer to in electrical installations?
    a. type of material used for wires
    b. electrical resistance of wires
    c. appropriate cross-sectional area of the conductor for the current load
    d. length of the wiring system

11. Which of the following is the correct procedure for determining the number of circuits in a building?
    a. by dividing the total load by the voltage
    b. by calculating the total current required and ensuring each circuit is protected with a fuse or breaker
    c. by using only one large circuit for all appliances
    d. by estimating the length of the building

12. In a building's electrical layout, a power sub-circuit is designed to carry 15 A of current. What is the minimum wire size (in mm^2) required for this circuit, considering the wire's permissible current density of 4 A per mm^2?
    a. 3.75 mm^2 b. 4.5 mm^2 c. 5 mm^2 d. 6 mm^2

13. In a radial distribution system, power is supplied from a single source to various loads. If there is a fault in one of the circuits, how does it affect the system?
    a. The whole system remains unaffected
    b. Only the loads downstream from the fault location is affected
    c. The entire system may be affected
    d. The entire building gets disconnected

14. What is the most common voltage used in the secondary distribution system for residential buildings?
    a. 110 V b. 400 V c. 180 V d. 220V

15. What is the purpose of using a "service main" in a power distribution system?
    a. To distribute power within the building
    b. To protect circuits from overload
    c. To connect the building to the external power grid
    d. To step down the voltage for household use

16. What is the main difference between an MCB and an MCCB (Molded Case Circuit Breaker)?
    a. MCB is used for high-current protection, while MCCB is used for low-current protection
    b. MCB is manually operated, while MCCB is automatic
    c. MCB is for low-power circuits, while MCCB is used for higher current circuits
    d. There is no difference between MCB and MCCB

17. An MCB is rated 16A and is protecting a circuit with a 12A load. What is the expected outcome?
    a. The MCB will trip immediately
    b. The MCB will never trip
    c. The MCB will trip after a delay
    d. The MCB will operate at half the current rating

24 FEB 2025

18. What is the key benefit of using sensors for building management?
    a. Increased entertainment options
    b. Improved energy efficiency
    c. Faster internet speeds
    d. Enhanced telephone communication

19. What is the key challenge when installing a biogas system in a building?
    a. The system is too costly to install
    b. It is only effective during the summer months
    c. It generates excessive noise
    d. A large amount of organic waste is required

20. Which of the following is the core function of IoT devices in buildings?
    a. Connecting physical devices to the internet for data exchange and control
    b. Managing telephone lines
    c. Distributing public announcements
    d. Broadcasting television programs

KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Level : B.Arch.
Year : III
Time : 2 hrs. 30mins.

24 FEB 2025

Course : EEEG 331
Semester : II
F. M. : 40

SECTION "B"
[5 Q. × 8 = 40 marks]

Attempt ANY FIVE questions. Assume any suitable data if necessary.

1.
   a. Draw a neat figure of the electrical supply system, highlighting the single-phase distribution from the grid utility to the residential consumer with appropriate indications. [3]
   b. Define and explain open and short circuits. [2]
   c. What is the function of an earth wire? Draw a neat schematic figure of plate earthing. [3]

2.
   a. A shop 16m X 10m is illuminated with 200W incandescent lamps. If a CU of 0.68 and an MF of 0.75 are selected, and an illumination of 260 lux is required at the workspace, calculate: (*Mounting height = 2m, assume other values as required).*
      i. Number of luminaires and subcircuits required.
      ii. Rating of fuse/MCB
      iii. A figure showing the arrangement of lamps, distribution box, and switch boxes. [2+1+3]
   b. Explain the key lighting system considerations for various types of occupancies, including residential, commercial, and industrial spaces. [2]

3.
   a. Describe the fundamental principles of illumination, including the concepts of luminous flux, illuminance, luminance, and efficacy. [2]
   b. Explain why proper training and awareness for building occupants and electrical professionals are crucial in minimizing shock hazards. Also, describe what a Residual Current Circuit Breaker (RCCB) is and how it improves electrical safety in buildings. [4]
   c. In what ways can IoT technologies transform the maintenance and operation of building services, and how can architectural students incorporate these innovations into their designs for smarter, more efficient buildings? [2]

P.T.O.

4.

a. Explain the types of electric power distribution system. [2]
b. Light and power sub-circuits are designed separately due to their distinct roles and load requirements in an electrical system. Why? [2]
c. Describe the function, operation, and benefits of Miniature Circuit Breakers (MCB) in electrical protection. [4]

5.

a. What are the different types of wiring systems used in buildings? [2]
b. Discuss the process of sizing conductors in an electrical installation for buildings. [3]
c. For the floor plan in figure 1 below, Prepare a light layout plan indicating switch location and power layout plan. *(Only draw layout in your answer sheet, no need to draw furniture/hatches/stairs/other components)* [3]

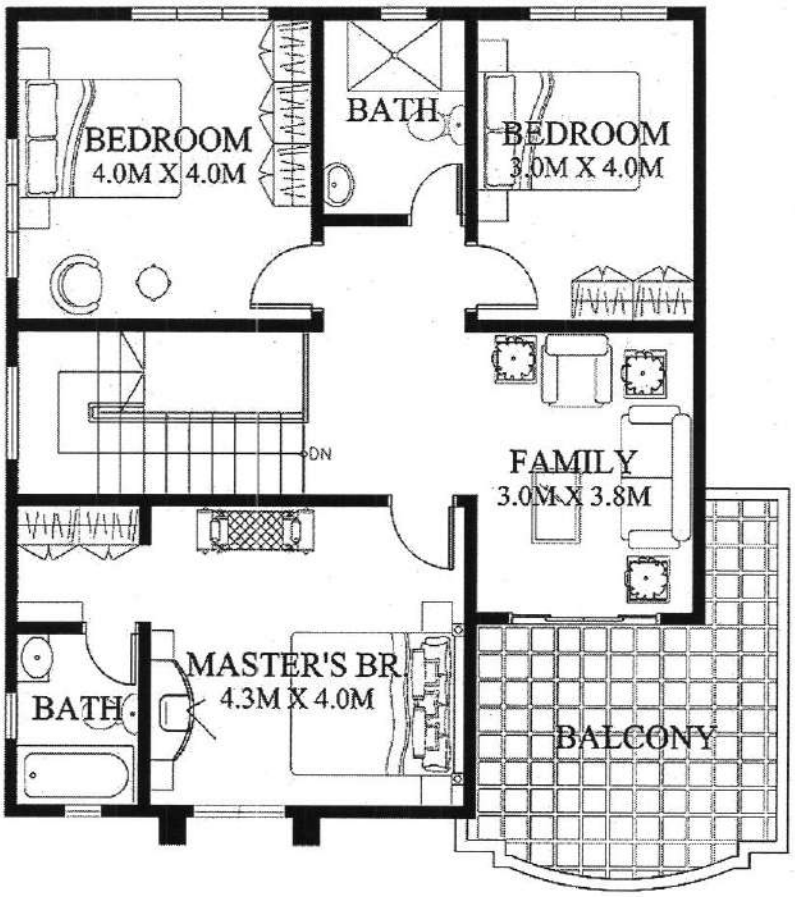

Figure 1: Floorplan

6.

a. Followings are the details of the load to be used in a remote small Hospital powered by solar PV. Assume inverter efficiency of 95% and battery efficiency of 98%. Consider equivalent solar radiation of 5 hours per day. Choose 75-Watt peak (Wp) module and battery system voltage of 12 Volt. [6]

SN	Load type	Power Consumption (W)	Nos.	Daily operating hours	Operating season	Remarks
1	LED Lamps	10	10	12	All	
2	Automated Bed	200	3	3	All	
3	Vaccine refrigerator	480* (Wh)	1	24	All	*Total energy consumption in 24 hours
4	Fan	60	5	10	Six month	Summer only

Calculate:

i. Average load for summer and winter.
ii. Total energy consumption in summer.
iii. Inverter size for AC loads.
iv. Number of PV panels.

b. Discuss the concept of a smart grid and its role in integrating alternative energy sources into the power supply system of buildings. [2]