KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Marks Scored:

Level : B.E.
Year : III

Course : EPEG 301
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 27 FEB 2025

SECTION "A"

[20 Q. × 0.5 = 10 marks]

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

1. Which one of the following power plants is the most efficient one?
   a. Steam Power Plant
   b. Hydro-electric Power Plant
   c. Diesel Power Plant
   d. Nuclear Power Plant

2. Kaplan turbines are used for _____ heads.
   a. low b. high c. medium d. all range

3. Which type of conductor material is commonly used for overhead power lines?
   a. Copper b. Iron c. Aluminum d. Silver

4. What is the main factor considered in the economic choice of conductor size for overhead lines?
   a. Cost of conductor material only
   b. Cost of energy losses only
   c. Balance between cost of material and energy losses
   d. Balance between environmental effects and development

5. What is the phenomenon of air ionization around a conductor called?
   a. Ferranti Effect b. Skin Effect c. Proximity Effect d. Corona Effect

6. A 10 MVA, 11 kV, delta-connected generator feeds a 10 MVA, 11/66 kV, delta-wye connected transformer. What is the line current on the high-voltage side of the transformer?
   a. 52.5A b. 87A c. 156A d. 270A

7. Which type of power transmission system is most commonly used for long-distance transmission?
   a. LVDC Transmission
   b. HVDC Transmission
   c. DC Transmission
   d. AC Transmission

8. In radial distribution system the distributor nearest to the feeding point will be _____?
   a. least loaded b. fairly loaded c. semi-loaded d. heavily loaded

9. The daily demand of a consumer is given as in Table 1. Assuming the consumer's connected load is 1200W, the closest load factor of the consumer is _____.

   a. 0.25

   b. 0.35

   c. 0.45

   d. 0.55

Table 1: Daily Demand

Time	Load
12 midnight to 8 A.M	No Load
8 A.M. to 2 P.M.	600 W
2 P.M. to 4 P.M.	200 W
4 P.M. to 10 P.M	800 W
10 P.M. to Midnight	No Load

10. The unvarying load which occurs almost the whole day on the station is known as __.
a. base load
b. peak load
c. maximum demand
d. demand factor

11. _____ is a method of transmitting data and voice signals over existing power lines.
a. FTTH
b. PLCC
c. FNLC
d. VoLTE

12. The diversity factor is always greater than 1 because _____.
a. The system is designed to handle more load than required.
b. It measures the total energy consumption of the system.
c. All connected loads do not operate at their maximum demand simultaneously.
d. It accounts for losses in the transmission and distribution system.

13. A device that protects equipment from transient overvoltage is called a _____.
a. Fuse
b. Relay
c. Circuit Breaker
d. Surge Protection Device

14. The intentional interruption of power supply to specific areas to prevent a complete blackout is known as _____.
a. Blackstart
b. Load shedding
c. Fault clearing
d. Voltage regulation

15. In a residential building, which type of wiring is most used for concealed installations?
a. PVC conduit wiring
b. Surface wiring
c. Open wiring
d. Trunking wiring

16. Which of the following is NOT a typical component of a service main for a residential building?
a. Service drop
b. Service entrance conductors
c. Metering unit
d. Transformer

17. A factory operates all year long without the plant shutting down. The average power consumption of the plant is 500 kW. If the electricity tariff is Rs. 10 per kWh, what is the annual electricity cost?
a. Rs. 43,800,000
b. Rs. 87,600,000
c. Rs. 175,200,000
d. Rs. 350,400,000

18. The _____ supply is used in large buildings when relatively high security is required.
a. Single rising main
b. Grouped supply
c. Ring main supply
d. Individual floor supply

19. This diagram shows the connection scheme of all appliances in sequence of the appliances used in the circuit.
a. Schematic diagram
b. Wiring diagram
c. Circuit diagram
d. Single line diagram

20. Which of the following power supply topologies is most commonly used in portable electronic devices?
a. Linear power supply
b. Switched-mode power supply (SMPS)
c. Uninterruptible power supply (UPS)
d. Battery power supply

KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

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

27 FEB 2025

Course : EPEG 301
Semester : II
F. M. : 40

SECTION "B"
[5 Q. × 8 = 40 marks]

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

1.

a. Illustrate the electrical supply with proper indications of the single-phase distribution system from grid utility to residential consumer. [4]

b. Provide a comprehensive overview of the various types of wiring systems used in buildings, such as conduit wiring, trunking, and surface wiring. Discuss the factors that influence the choice of a particular wiring system for different applications and environments. [4]

2.

a. Explain the working principle of a Thermal Power Plant. Discuss its major components and their respective functions in the generation of electricity. [4]

OR

Describe the working of a Hydro Power Plant. How does the potential energy of water get converted into electrical energy, and what are the key components involved in the process?

b. What are Energy Storage Systems (ESS), and how do they play a critical role in power generation from renewable energy sources? Discuss different types of energy storage technologies. [4]

3.

a. A proposed station has the following daily load cycle as shown in Table 1: Draw the load curve and select suitable generator units from the 10,000; 20,000; 25,000; 30,000 kVA. Prepare the operation schedule for the machines (set of generators) selected and determine the load factor from the curve. [6]

Table 1: Daily Load Profile

Time in hour	6-8	8-11	11-6	16-19	19-22	22-24	24-6
Load in MW	20	40	50	35	70	40	20

b. Explain the working principle of HRC fuse. [2]

OR

Explain the working principle of a Miniature Circuit Breaker (MCB).

P.T.O.

4.

a. In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11 % of the self-capacitance of each insulator, find the distribution of voltage over 3 insulators. [4]

OR

Describe the economics of power transmission with the aid of Kelvin's law.

b. What is a surge in an electrical power system, its causes, and the types of surge protection devices used to prevent damage? [4]

OR

Why is earthing important in electrical systems? Explain the plate earthing system with a diagram and describe its working principle.

5.

The daily load of a commercial building along with the energy charges set by NEA for TOD meter is shown in Table 2 below: [8]

SN	Appliances	Power Rating (Watts)	Quantity	Usage (hours) per day		
				Peak Time (18:00-23:00)	Off Peak Time (23:00-06:00)	Average (06:00-18:00)
1	LED Lights	20	15	2	2	6
2	Air Conditioner	1800	3	0	0	8
3	Water Dispenser	800	2	0	0	1
4	Desktop Computer	400	15	1	1	8
5	Photocopier Machine	1200	1	1	0	2
6	Electric Oven	1500	2	1	0	1

Consumer Category	Energy Charges (Rs. Per unit)		
	Peak Time (18.00 -23.00 hrs.)	Off Peak Time (23.00-06 hrs.)	Average (06.00-18.00 hrs.)
Commercial Building	8.65	5.25	7.55

i. Calculate the total energy consumption in kWh for a month.
ii. Determine the total electricity bill as per the NEA charge rate given in the table.
iii. Find the rating of MCB that must be used for protection of the commercial building.
iv. If the desktop computer and LED lights are to be supplied with backup energy system *(Inverter and Battery)*, what rating of Inverter must be used?

6. *ATTEMPT **ANY TWO***

a. Write in brief on thyristor. Explain its V-I characteristics and its working principle. [4]

b. How do SMPS convert and regulate voltage, and what are their efficiency, complexity, cost, and best-fit applications? [4]

c. How can solar panels, wind turbines, batteries, and generators in a hybrid power system be managed to maximize renewable use, ensure backup power, and optimize efficiency and cost? [4]

KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Marks Scored:

Level : B.E.
Year : III

27 FEB 2025

Course : EPEG 315
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

SECTION "A"

[20 Q. × 0.5 = 10 marks]

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

1. The current largest hydropower of Nepal is
   a. Upper Tamakoshi Hydropower
   b. Kulekhani Hydropower
   c. Dhalkebar Hydropower
   d. Buddi Gandaki Hydropower

2. A 100MVA generator of 8kV has a reactance of 5%. The reactance value after converting to a new base of 400 MVA and a new voltage base of 16kV will be
   a. 0.1pu b. 0.15pu c. 0.25pu d. 0.48pu

3. For the same power transmission between source and load, the increase in number of circuits from 1 to 2 will
   a. Allow choosing of relatively large transmission voltage to the original
   b. Allow choosing of relatively small transmission voltage voltage to the original
   c. Decreases the tower height
   d. The transmission voltage is unaffected to the change in number of circuit

4. Which structure has the lowest probability of corona formation?
   a. Spherical b. Triangular c. Rectangle d. Needle

5. A transmission line connecting two substations of 80kms has an ampacity of 1000A and three phase line voltage of 400kV (Take power factor as unity). The maximum thermal power this line can transfer is
   a. 225 MW b. 693 MW c. 800 MW d. 775 MW

6. The most important criterion while designing the electric distribution systems is
   a. Line loss b. Corona c. Efficiency d. Voltage drop

7. The current power system loss of Nepal is around
   a. 10% b. 5% c. 15% d. 6.25%

8. Which modeling approach will you choose for a long transmission line?
   a. Nominal-T model
   b. Nominal-pi model
   c. Distributed model
   d. Resistance and Inductance model

9. Calculate the most economical voltage for transmission of 300MW over 120kms at a power factor of 0.8.
   a. 132kV b. 220kV c. 400kV d. 765kV

10. An ACSR conductor has an ampacity of 300A. What is the tentative conductor temperature when the conductor carries 300A?
    a. 75° Celsius b. 120° Celsius c. 20° Celsius d. None of the above

11. Which of the following is a desirable condition in overhead transmission line?
    a. Lower inductance and Lower capacitance
    b. Higher inductance and Lower capacitance
    c. Lower inductance and Higher capacitance
    d. Higher inductance and Higher capacitance

12. For the same conductor size and length for both underground and overhead lines, which of the following statement is true?
    a. Cable has lower capacitance and higher inductance than overhead lines
    b. Cable has higher capacitance and lower inductance than overhead lines
    c. Cable has lower capacitance and lower inductance than overhead lines
    d. Cable has same capacitance and lower inductance than overhead lines

13. Loss of load factor is used to _____
    a. Convert peak power loss to average power loss
    b. Convert average power loss to peak power loss
    c. Calculate load factor
    d. Calculate the ampacity of the conductor

14. An insulator string with low string efficiency signifies:
    a. Non uniform electric stress on all insulators
    b. More leakage loss
    c. Uniform electrical stress on all insulators
    d. No electrical stress on all insulators

15. Which tower type will you choose at very sharp bending?
    a. Type A tower b. Type B tower c. Type D tower d. Type C tower

16. A factory operates for 8 hours with a peak load of 4MW @0.8pf operating for 3 hours and 1 MW operating for 5 hours at 0.8pf. The required shunt compensation for unity power factor operation will be:
    a. Fixed capacitor of size 0.75MVAR and a switched capacitor of size 2.25 MVAR.
    b. Fixed capacitor of size 2.25MVAR and a switched capacitor of size 0.75 MVAR.
    c. Fixed inductor of size 0.75MVAR and a switched inductor of size 2.25 MVAR.
    d. Fixed inductor of size 2.25MVAR and a switched inductor of size 0.75 MVAR.

17. Corona causes
    a. Decrease in loss of reactive power in transmission lines
    b. Decrease in loss of active power in transmission lines
    c. Increase in loss of reactive power in transmission lines
    d. Increase in loss of active power in transmission lines

18. Which of the following cause of over-voltage is most severe in Ultra-High Voltage lines?
    a. Lightning surge b. Switching surge c. Ferranti effect d. Temporary overvoltage

19. The standard switching voltage used for testing for the condition of lightning in laboratory is?
    a. 160/1600s b. 2.5/2500s c. 250/2500 μs d. 1.2/50μs

20. Choose the most important criterion while performing the electrical design of towers
    a. Current b. Transmission voltage
    c. Lightning surge d. Grounding of tower