

KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

Marks Scored:

Level : B.E.

Year : III

Exam Roll No. :

Time: 30 mins.

Course : EPEG 301

Semester : II

F. M. : 10

Registration No.:

Date :

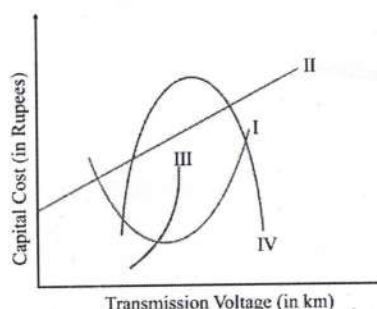
11 JUL 2023

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Encircle the most appropriate answer.

- What is the total power installed capacity (approximate) in Nepal?
a. 1850 MW b. 1580 MW c. 2910 MW d. 2190 MW
- In which part of thermal power plant, the steam pressure is less than that of atmosphere?
a. Boiler b. Turbine c. Superheater d. Condenser
- Graphite is used in nuclear power plant as a
a. Fuel b. Coolant c. Moderator d. Electrode
- Demand factor is the ratio of _____ to _____.
a. average load; maximum demand b. maximum demand; connected load
c. maximum demand; average load d. connected load; maximum demand
- Which of the curves shown in the figure represents the relation between capital cost and the transmission voltage?
a. Curve I
b. Curve II
c. Curve III
d. Curve IV
- Which type of insulators are used on 132 kV transmission lines?
a. Pin type b. Disc type c. Shackle type d. Pin & Shackle type
- SF₆ provides better arc quenching because of its _____ property.
a. Superconductivity b. Restriking
c. Electronegativity d. Transient
- For differential protection of power transformers(Δ-Δ), the CTs will have _____ connections.
a. Y - Y b. Y-Δ c. Δ - Y d. Δ - Δ
- Which relay is used to detect and protect internal faults of a transformer?
a. Buchholz relay b. Directional relay c. Thermal relay d. Distance relay
- The distributors in residential areas are
a. 1-φ, 2-wire b. 3-φ, 3-wire c. 3-φ, 4-wire d. 2-φ, 4-wire



11. The area under daily load curve divided by 24 hours gives
 a. Average load b. Least load c. Peak demand d. Total kWh generated
12. RTU is a
 a. Transmitter b. Receiver c. Trans-receiver d. Interconnector
13. Maximum permissible span with wooden poles is _____ m.
 a. 20 b. 30 c. 50 d. 100
14. From the list below, make a match of the correct combinations
- | List 1 | List 2 |
|------------------------------|----------------------------------|
| (Name of Power Plant) | (Plant Features) |
| A. Thermal | 1. High operating cost |
| B. Nuclear | 2. High capital cost |
| C. Hydro | 3. High plant life |
| D. Diesel | 4. High fuel transportation cost |
| a. A-3, B-1, C-4, D-2 | b. A-4, B-2, C-3, D-1 |
| c. A-3, B-2, C-4, D-1 | d. A-4, B-1, C-3, D-2 |
15. If the cathode of an SCR is made positive with respect to the anode & no gate current is applied then
 a. All the junctions are reversed biased
 b. All the junctions are forward biased
 c. Only the middle junction is forward biased
 d. Only the middle junction is reversed biased
16. Single phase half bridge inverters requires _____ supply.
 a. 2-wire ac b. 2-wire dc c. 3-wire ac d. 3-wire dc
17. According to Albert Betz, no wind turbine can convert more than _____ of kinetic energy of the wind into mechanical energy.
 a. 52.6% b. 59.3% c. 63.2% d. 68.5%
18. Maximum demand tariff is generally not applied to domestic consumers because
 a. They consume less power b. Their load factor is low
 c. Their maximum demand is low d. This leads to higher tariff cost
19. The diversity factor of an industrial consumer will be _____
 a. ≥ 1 b. = 1 c. ≤ 1 d. < 0
20. The size of earth wire is determined on the basis of
 a. Voltage of the service line
 b. Current carrying capacity of the service line
 c. Atmospheric conditions
 d. Required level of safety

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

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

SECTION "B"

[5 Q. × 8 = 40 marks]

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

1.
 - a. Explain shortly the history of electrical power system in global context. Discuss the possibilities of power import/export by Nepal with its neighboring countries. [2+2]
 - b. Draw a labelled schematic diagram of a typical thermal power station. How do you compare thermal plants with hydroelectric plants from the economic point of view? [4]
2.
 - a. List some of the recent technologies used in electric energy storage. Highlight the importance of energy storage devices for operation of power grid. [4]
 - b. State the empirical formula for determining the economic system voltage of transmission line. Employ it to recommend the standard transmission voltage for evacuating 450 MW power through 790 km double-circuit line. [1+3]
3.
 - a. List out the important properties of conductor materials. Explain in detail the most commonly used conductor materials for transmission lines. [2+2]
 - b. What is a fuse? List the most common types of fuses that you know. Why a fuse element is always connected in series with the circuit to be protected? Explain how the fuse provides protection to the electrical loads. [1+0.5+1+1.5]
4.
 - a. What is a relay? Explain different type of relays along with their practical application in power system. [1+3]
 - b. Explain different schemes of vertical rising main supply system mentioning their application in commercial and industrial buildings. [4]
5.
 - a. Make some sketches showing the construction and $v-i$ characteristics of a thyristor. Write in short about its working principle and different operating states. [2+2]
 - b. A 3-phase transformer having line-voltage ratio of 0.4 kV/11kV is connected in star-delta and protective transformers on the 400 V side have a current ratio of 500/5. What must be the ratio of the protective transformers on the 11 kV side? [4]

6. a. A small scale industry has following loads. Make a total load estimate considering the utilization factor (k_u) and diversity factor (k_s). [4]

- 9 Fluorescent lamps each of 50 VA
- 2 compressors each of 5 kVA
- 3 socket outlets (10/16 A) with total of 9 kVA load
- 1 Oven of 5 kVA
- 1 conveyor motor of 8 kVA
- 3 water pumps: 2 pumps of 3.2 VA and 1 pump of 4.7 VA

The corresponding values of utilization and diversity factors are given in tables below:

Table 1: Diversity factor according to circuit function

Circuit function	Diversity factor (k_s)
Lighting	1
Heating and air conditioning	1
Socket-outlets	0.15
Lifts and catering hoist	
For the most powerful motor	1
For the second most powerful motor	0.75
For all motors	0.60

Table 2: Diversity factor for distribution boards

Type of load	Assumed loading factor
Distribution – 2 and 3 circuits	0.9
Distribution – 4 and 5 circuits	0.8
Distribution – 6 to 9 circuits	0.7
Distribution – 10 or more circuits	0.6
Electric actuator	0.2
Motors \leq 100 kW	0.8
Motors $>$ 100 kW	1.0

Table 3: Utilization factor for different loads

Type of load	Factor of maximum utilization (k_u)
Lighting loads	1
Industrial motors	0.75
Socket-outlet circuits	0.5
Electric Vehicle	0.2

- b. Write short notes on:
- i. Earthing for electrical systems
 - ii. Hybrid electrical power system

[2+2]