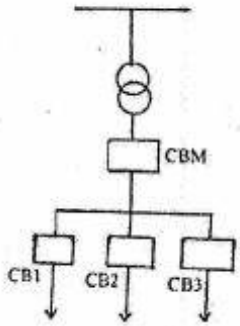
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2083 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification (*Elective I*) (*EE72502*)

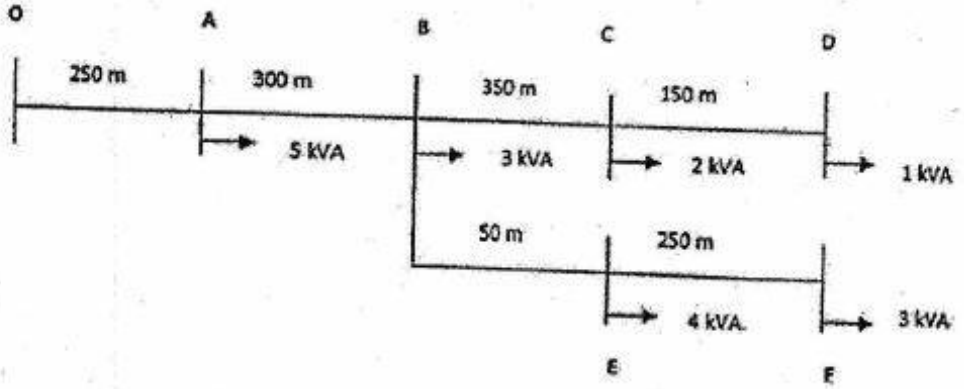
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the social factors in rural development? Explain each. [8]
2. Explain the impact of rural electrification in rural development. [8]
3. Differentiate between utility-operated and community-operated (CBRE, CBOM) grid-based rural electrification schemes in the Nepalese context. Discuss their respective investment modalities and consumer service aspects. [4+4]
4. Find out the overall efficiency of a hydropower plant with installed capacity of 50 kW, design discharge of 324 m^3/hr and design head of 350 ft. Define main components of a solar home system and describe their role. [4+4]
5. Calculate SAIFI, SAIDI, CAIDI and ASAI of the system given below. The number of tripping and trip duration are given for one year period. [8]



Feeder breaker	No. of trip	Trip duration (hrs)	Number of customers
CBM	0	0	900
CB1	0	0	400
CB2	250	150	300
CB3	275	450	200

6. Explain the major environmental concerns associated with rural electrification projects and propose suitable mitigation measures. [8]
7. Find load voltage at point F. The loads at different nodes and span length are given in the load flow diagram. The line voltage at node 'O 'and conductor specifications are as follows. Line voltage at node 'O' is 400 V; r = 0.4 ohm/km; x = 0.3 ohm/km. [8]



8. Describe the systematic process of fixing load points on a contour map and calculating the total load for a rural electrification network design. [8]
9. A newly electrified rural village experiences frequent voltage fluctuations and occasional power outages. As an RE network operator, outline the steps you would take for condition monitoring and basic repair and maintenance to address these issues. [8]
10. Discuss the importance of inventory management in rural electrification. How can proper inventory control reduce downtime and improve efficiency? [4+4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2081 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification (*Elective I*) (*EE72502*)

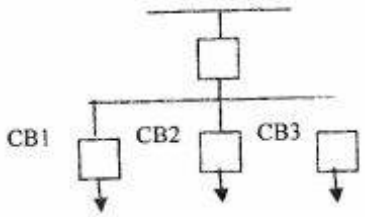
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. How does Rural Electrification uplifts the socio economic status of rural community through livelihood diversification? Explain briefly. [6]
2. What is end use promotion of electricity? Why is this component considered necessary for isolated hydro power? [6]
3. What is energy mix? Describe the energy mix of Nepal. [6]
4. The flow of water in a river is 10806 cu ft per hour. If that water is dropped into a turbine from 236 ft above, then how much electricity can theoretically be generated. [4]
5. There is no governor in micro hydro, so describe how the frequency is controlled? [6]
6. Describe the various components of Solar-Home System with schematic representation of basic components. Write advantages and disadvantages of such system in Rural Electrification. [8]
7. What is Environmental Impact Assessment and explain its importance during project development. Write the major stages involved while performing EIA. [8]
8. A generating station has the following daily load cycle:

Time	0-6	6-9	9-11	11-16	16-19	19-22	22=24
Load (kW)	40	50	45	55	30	100	20

Draw the load curve and find load factor [4]

9. Calculate SAIFI, SAIDI and ASAI for the given system with following annual data. [4]

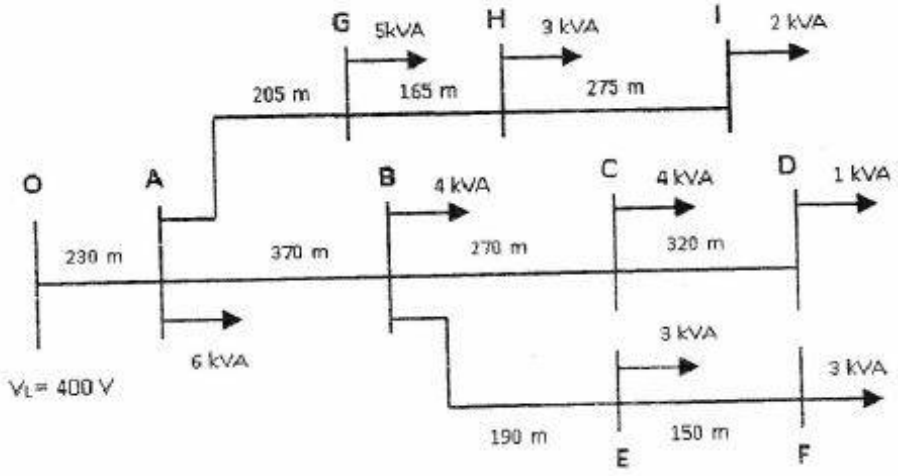


Breaker	No of trip	Duration of trip (Hr)	No of consumers
CBM	18	25	15000
CB1	34	36	4000
CB2	328	190	6000
CB3	52	210	5000

10. Explain the protection System of 11/0.4 kV, 200kVA distribution transformer with necessary diagrams and suggest the ratings of protective devices. [6]
11. Describe condition monitoring with reference to a transformer. [6]
12. Describe what items need to be kept in inventory for rural electrification network operation and why? [8]

13. Find VL at node "F". Conductor specifications are given below. [8]

r = 0.4 ohm/km; x = 0.3 ohm/km



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification (*EE72502*) (*Elective I*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Diversification from farming activities to some nonfarm activities makes rural livelihood sustainable. Discuss. [4]

   b) Introduction of the concept of "One best way" in management, increased the efficiency of employees as well as the productivity. Explain with an example. [4]

   c) Rural electrification is a infrastructure for rural development. Discuss. [8]

2. a) A 0.4 m^3 container was placed under a pipe from a stream. The container was filled up in 10 secs. If this water is diverted to a micro hydro with following parameters what will be the power generation? [4]

   Head = 102m Efficiency = 55%

   b) Explain the role and importance of expansion joints in micro hydro installations. [4]

   c) A 12 V battery capacity of 400 Ah is supplying a load. The battery is at 90% SoC and the depth of discharge is 75%. Find [4]

      i) The charge stored in the battery.

      ii) The maximum energy the battery can deliver to the load.

   d) A wind turbine generates 50 kW with a wind velocity of 6m/s. What will be the power generation if the wind velocity is doubled? [4]

3. a) Why it is necessary to conduct environmental feasibility study for a hydropower project? Also explain the content of this report. [8]

   b) Phase voltage at a house located at far end of a distribution transformer was found to be 195 volt. Do the supply voltage meets electricity regulation's requirement? If not then what the utility need to do? [4]

   c) A 0.4 kV distribution transformer supplies 394,000 kWh in a year through a conductor having resistance of 0.36 ohm. The peak load is 76 kW and the load power factor is 0.85. Find [4]

      i) Load factor.

      ii) Actual loss in conductor .

      iii) Revenue loss in a year @ Rs 8/kWh.

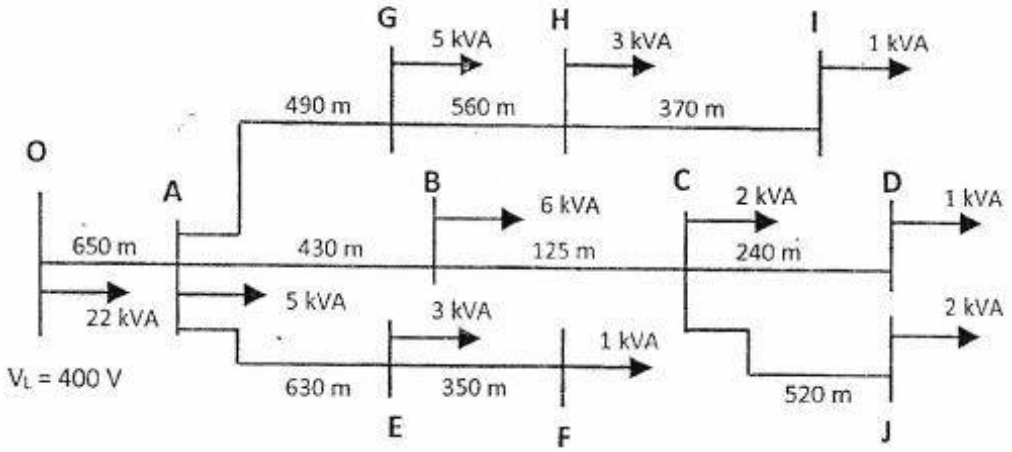
4. a) Explain the operation of circuit breaker, load break switch and isolator in relation to current. Also show the application of these devices in a 11 kV feeder. [4]

   b) An 11/0.4 kV-25 kVA transformer has only one load and that is a lift irrigation pump of 15 kW. The pump operates for 13 hrs a day. An energy meter is installed at 11 kV side and it shows the consumption of 24 hrs equal to 201 kWh. Find all day efficiency of transformer. [4]

c) Load flow diagram of a 400 V distribution line is mentioned below. The specific resistance and specific inductive reactance of the line are 0.4 ohm/km 0.3 ohm/km respectively. Find [8]

i) V_L at point 'J'.

ii) Power loss at section A-B.



5. a) Per unit cost of electric energy can be reduced by proper load management. Explain with a load curve of micro hydro. [8]

b) What is condition monitoring and how it helps to reduce the breakdowns and outages of an electric network? [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	[redacted]	Back	
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the components of rural livelihood? Explain the rural livelihood indicators in brief. [8]
   b) What are the current national plans and objectives for rural development? Explain on the basis of rural electrification. [6]
2. a) Hybrid system are becoming popular now days for rural electrification. What are the advantages of hybrid system in rural electrification? Explain on the basis of micro-hydro, photo voltaic and wind energy hybrid systems. [8]
   b) Though there several micro-hydro constructed in different rural part of the country, only small amount of micro-hydro are in operation. What may be the discouraging factors for this condition? What could be the solution? Give you perspective. [8]
3. a) List out points quoted on the equipment and human safety in construction and operation of rural electrification as per Electricity Regulation. [6]
   b) What is the significance of reliability indices in rural electrification? Determine different reliability indices for the data of outage and customers for the date January in a place. The total numbers of customer were 40000. Data is given below: [2+6]

Date	Customer	Outage Duration (minutes)
28	100	100
28	2000	30
28	2	140
28	4	130
28	5	35

4. a) Derive the power loss and voltage drop relation in a uniformly increasing load. How voltage drop can be minimized in radial feeder? [8]
   b) List out the equipment and hardware that are used in rural electrification network. How do you plan for rural electrification in certain area as a electrical engineer and a planner? [8]
5. a) What do you mean by load leveling and demand side management? Explain with a practical example. How an unbalanced load effect on system efficiency and how it can be made balanced in an electric network? Explain with your view. [8]
   b) What is the importance of load factor, plant capacity and diversity factor in the design and operation of electrical system? Explain on the basis of micro hydro based rural electrification. [4]
   c) Explain the protection system of an 11/0.4 kV, 200 kVA distribution transformer with appropriate figures and ratings of the protective devices. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification (*Elective I*)(*EE72502*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define rural electrification in our society. Explain the impact of industrialization and urbanization to rural electrification in case of Nepal. [2+6]

   b) What are the major end use of electricity in rural areas? Defining the concept of productive end use of electricity, discuss factors affecting it. [2+6]

2. a) Alternative energy source are intermittent in nature. Explain with diagram how continous rural electrification can be achieved. [8]

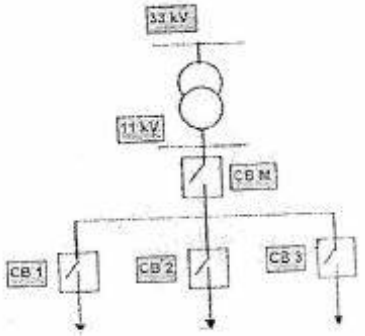
   b) Calculate the actual electric power that can be produced by a micro hydropower, if the available discharge (Q) is 2500 liter/hr, the head (H) available is 100 feet and overall efficiency of the plant is 50%. [4]

   c) Determine the power in the wind if the wind speed is 10 m/s and blade length is 6m. [4]

3. a) What is EIA? What environmental impacts occur on physical and biological environments during developing of development projects? List the possible mitigation measures. [8]

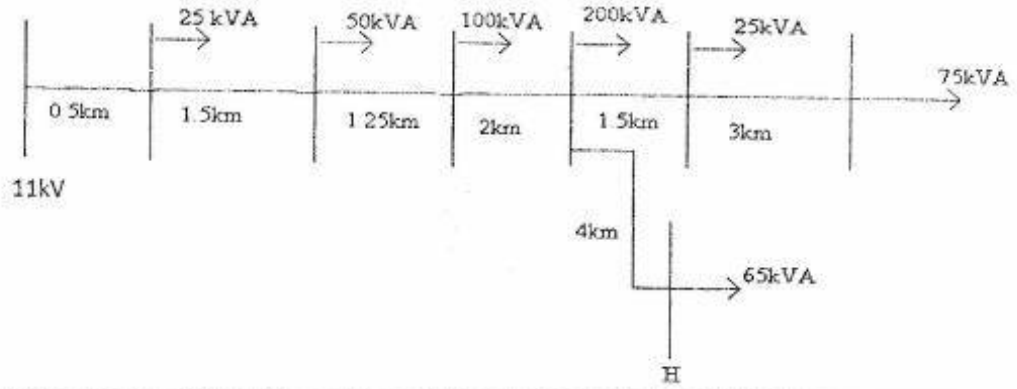
   b) Calculate SAIFI, SAIDI, CAIDI and ASAI for the given system. Number of tripping and trip duration of the circuit breaker during 1 month period are given in the table below. 1 month = 31 days in this case. [8]

CB	No. of Trip	Outage Duration (Hr)
CBM	6	6.4
CB1	9	8.7
CB2	5	3.98
CB3	3	7.38



4. a) For a rural electrification, NEA has provided a supply of 11/0.4 KV. Now you are required to build a single phase distribution network for a periphery of 1 km radius having five houses. Prepare a bill of quantities of required hardware along with single line diagram. [8]

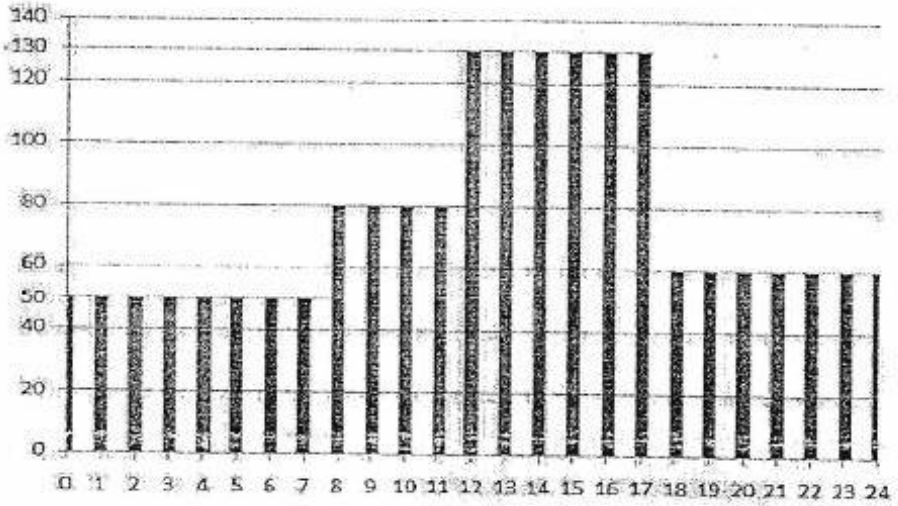
   b) Calculate percentage voltage drop at end point H of the following distribution system using kVA-km conductor loading method. The conductor size is 20 mm^2 Al, diversity factor is 2.5 and % voltage regulation limit is 5%. [8]



Conductor (mm^2)	kVA-km for line regulation for 11kV overhead line		
	5%	6%	7%
20	3630	4410	5210
30	5170	6270	7380

5. a) Explain different types of fault that occurs in rural electrification network. Which type of network is most suitable for rural electrification and why? [4+4]

   b) The average daily load profile of a feeder is shown in the figure below where the y-axis shows load in kW and x-axis shows time in hr. If the peak power loss is 15%, calculate the energy loss per year of the feeder. [8]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE 72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
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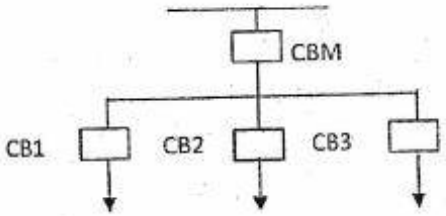
1. a) Rural Electrification plays a vital role in livelihood diversification of rural society. Discuss. [6]
   b) Industrialization and global warming are closely linked to each other. Explain. [4]
   c) Define productive use of electricity, its components and its importance for distributing utility. [6]
2. a) Determine the electrical power output of a wind turbine with following parameters. [4]
   (i) Wind velocity = 10m/s;
   (ii) Blade length = 5m;
   (iii)Efficiency = 34%
   b) Write short notes on: [2×3]
   (i) Settling basin
   (ii)Expansion joint
   c) Explain the components and their role of an off-grid solar PV system with a sketch. [6]
3. a) Explain how physical environment of an area is affected during construction of a hydropower and how it can be mitigated. [8]
   b) Calculate SAIFI, SAIDI and ASAI for the given system with following annual data: [4]



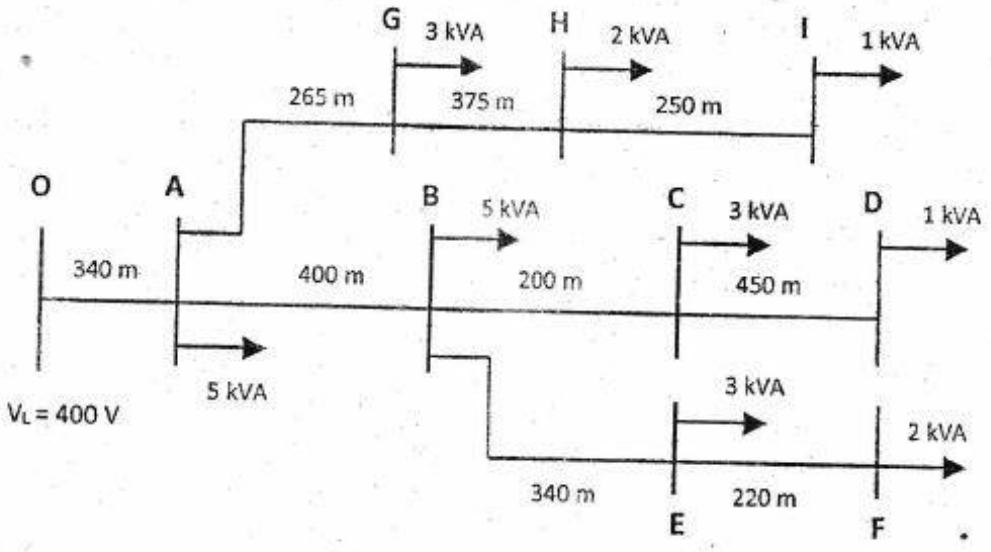
Breaker	No of trip	Duration of trip (Hr)	No of consumers
CBM	15	25	11000
CB1	45	150	3400
CB2	215	370	3600
CB3	30	50	4000

   c) No load and Full load losses of a distribution transformer are 250W and 1000W respectively. Calculate the actual revenue loss for following loadings. Energy charge is Rs. 7/kWh. [4]
   (i) 25% loading
   (ii) 75% loading

4. a) Against what the 11kV feeder should be protected and how? [4]

b) Calculate the discounted payback period of following project. [4]
Initial investment = 5,000,000
Annual cash flow = 1,470,000
Project life = 8 yrs
Cost of capital = 11%

c) Find V_L at point 'D' conductor specifications are as follows: [8]
r = 0.4ohm/km; x = 0.3ohm/km



5. a) A micro hydro of 80kW capacity supplies 672 kWh per day to local community. The plant runs at 80kW for 3 hours only per day. Explain load management with this example. [8]

b) Define inventory and explain why distribution utility should keep inventory. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Social factors need to be considered during designing of a development programme. Discuss. [6]

   b) White paper 2075 has established a target to increase per capita electricity consumption upto 700 kWh within 5 years. Explain how it can be achieved. [4]

   c) Rural electrification contributes in socio economic uplift of rural community through livelihood diversification. Explain. [6]

2. a) Define main components of a wind turbine and describe their role. [6]

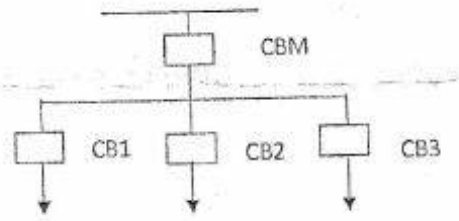
   b) A micro hydro with following parameters generates 595,680 kWh of energy during 1 year period. Calculate the efficiency of that plant. [5]

   (i) Head = 328 ft.
   (ii) Discharge = 9000 litre/min
   (iii)Plant factor = 85%

   c) What are the technologies adopted for rural electrification in Nepal. Explain why different technologies are adopted for rural electrification instead of electrifying whole Nepal through national grid. [5]

3. a) A development project make some impacts on biological environment. Define those impacts and suggest how those can be mitigated. [6]

   b) Calculate SAIFI, SAIDI and ASAI for the given system with following annual data. [5]



Breaker	No of trip	Duration of trip (Hr)	No of consumers
CBM	10	20	8000
CB1	25	110	2500
CB2	415	410	2000
CB3	130	150	3500

   c) Calculate the actual annual revenue loss of a distribution network having following parameters. [5]

   (i) Annual Energy = 7 GWh
   (ii) Peak load = 1400 kW
   (iii)Peak Power loss = 70 kW
   (iv)Tariff = Rs. 8 /kWh

4. a) Explain protection system of a 11/0.4kV, 250 kVA distribution transformer with a neat sketch. Also suggest the appropriate ratings of the protective devices. [4]

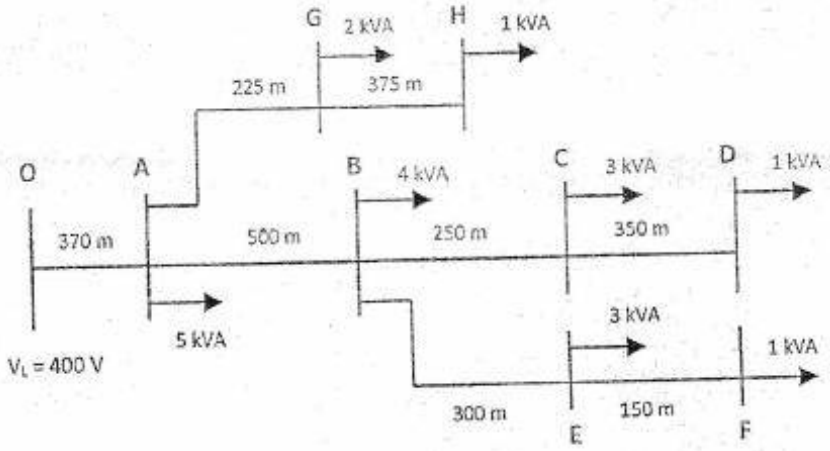
b) An 110V, 5A energy meter is connected in a 33kV feeder to record the amount of energy supplied during a period of 1 month. Determine the energy supplied through that feeder during the period. The PT ratio, CT ratio and meter readings are as follows: [4]

PT ratio = 66000/110 V; Previous reading - 3875

CT ratio = 250 / 5A; Present reading - 4561

c) Find V_L at point 'F'. Conductor specifications are as follows: [8]

r = 0.4ohm/km; x=0.3 ohm/km



5. a) What types of faults generally occur in distribution network. What do you suggest to minimize the probability of fault occurrence? [8]

b) Explain the complications related to metering, billing and revenue collection in rural electrification network operation. [8]

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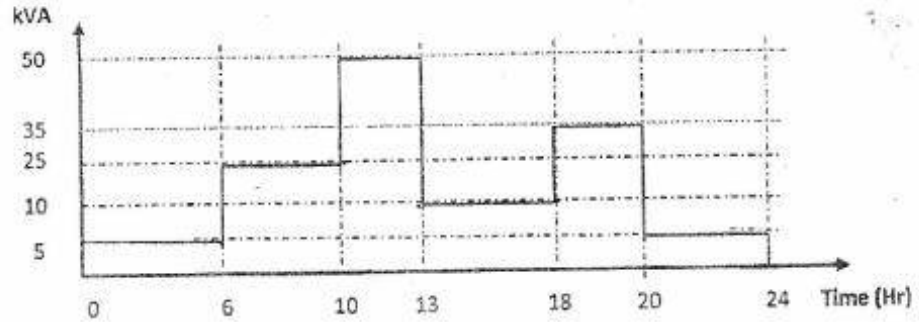
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

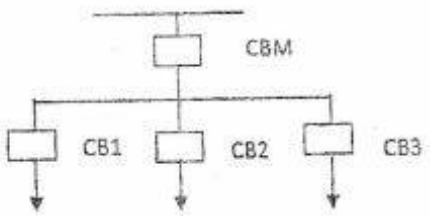
Subject: - Rural Electrification *(Elective I) (EE72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is rural livelihood? Explain the role of rural electrification on socio-economic uplift of the rural community through livelihood diversification. [8]
2. a) Health condition of rural women is being improved by rural electrification. Discuss. [4]
   b) Rural electric cooperatives need to run some programmes on end use promotion of electricity. Explain. [4]
3. a) Define main components of a solar home system and describe their role. [4]
   b) Calculate the efficiency of a micro hydro with the following parameters.
   (i) Head = 250 ft (ii) Discharge = 4500 litre/min (iii) Power = 28 kW [4]
   c) Define grid and its components. Explain grid based rural electrification in Nepalese context with a neat sketch. [8]
4. a) What is environmental impact assessment and why it needs to be carried out for a development project? Explain some impacts of a development project on physical environment and suggest probable mitigation measures. [8]
   b) Define load factor. Find load factor of the given load curve. [4]



c) Calculate ASAI for the given system with following annual data. [4]

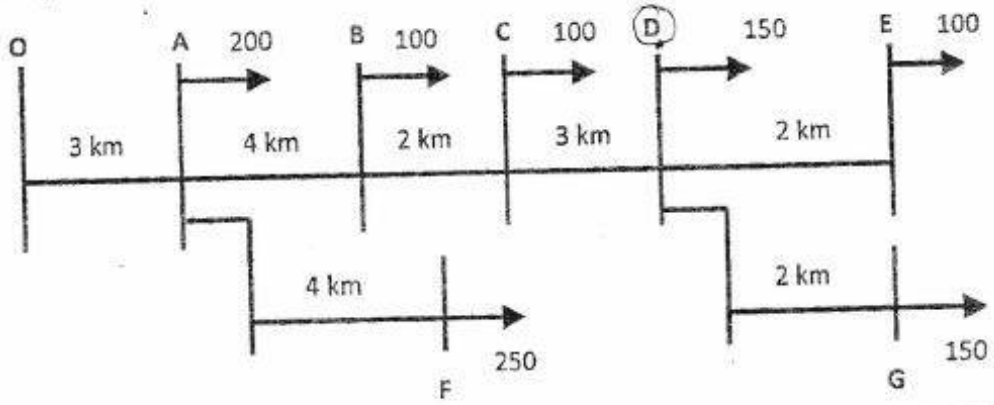


Breaker	No of trip	Duration of trip (Hr)	No of consumers
CBM	0	0	7500
CB1	125	230	2000
CB2	175	110	3000
CB3	250	750	2500

5. a) Explain 400 V radial rural electrification network design process of an area to be covered by an 11/0.4 kV distribution transformer. [4]

b) Define load break switch. Explain the role of load break switch in an 11 kV radial distribution feeder with a neat sketch. [4]

c) Find out the % voltage drop at point "D" using kVA-KM conductor loading method. The conductor size is 30 mm2. The diversity factor is 2.0 and the permissible voltage drop is 5%. Loads at different points are given in kVA. [8]



ACSR (Sq mm)	kVA-KM for line regulation for 11 kV overhead line		
	5%	6%	7%
20	3630	4410	5210
30	5170	6270	7380

6. a) What is load management? What are the different strategies of load management? [6]

b) Engineer should give more focus on corrective and preventive actions rather than correction. Explain with appropriate examples. [6]

c) Define inventory management. Explain the importance of inventory in rural electrification network operation. [4]

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16 B TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject - Rural Electrification *(Elective I) (EE72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

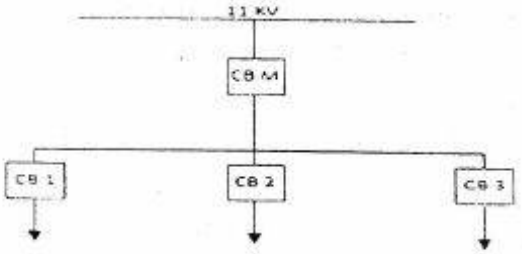
1. How do you relate energy and national development? Why national grid should be promoted in rural area instead of investing in off-grid electrification like Solar Home System and Micro Hydro etc. [8]

2. Some research said that there is about 20 MW of Solar PV systems in Kathmandu valley in off grid mode. After continuous supply of Grid electricity and minimization of load shedding, it is being almost useless. Explain with figure, how you use this energy to boost the country's economy? [8]

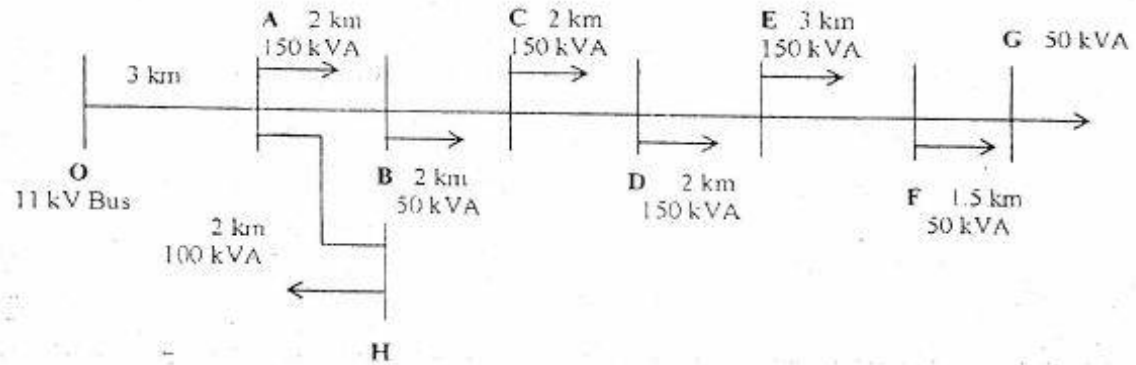
3. Now days Wind as the energy resource is pronouncing in Nepal. Do you think wind energy is economic option in Nepal? Make a sketch of grid tie wind power station and explain its components? [8]

4. Calculate reliability indices: SAIFI, SAIDI, CAIDI of the distribution system as shown in the diagram below. The number of tripping and trip duration are given for a period of one year. [6]

CBs	No. of Trips	Duration of Trip	No. of Customers
CB M	7	2	7500
CB 1	101	125	2200
CB 2	75	211	2100
CB 3	51	111	3200



5. Compute percentage voltage drop at longest end point **G** of the following distribution system of 21 square mm conductor assuming kVA-km 4150 at 7% voltage regulation for the system and diversity factor 2.5. [8]



6. What do mean by payback period? Why shorter payback period is preferred? Compute payback period on the basis of following table of cash flows: [1+2+5]

Expected Cash Flow	Year 1	Year 2	Year 3	Year 4	Year 5
Cash Inflows	400	400	400	400	400
Cash Outflows	-900	-250	-	-	-

7. Consider a distribution network project involving an equal investment of $51,000 at the ending of each year over 5 years, starting today, with a discount rate of 10%. Find its present value. [5]

8. What do you mean by load management? Discuss about its advantages. [1+5]

9. Why it is necessary to maintain the inventory? [8]

10. Write short notes on: (any three) [5+5+5]
    a. Industrialization and Urbanization
    b. Prevention and Correction
    c. Conditioning Monitoring
    d. End use of Electricity

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16B TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

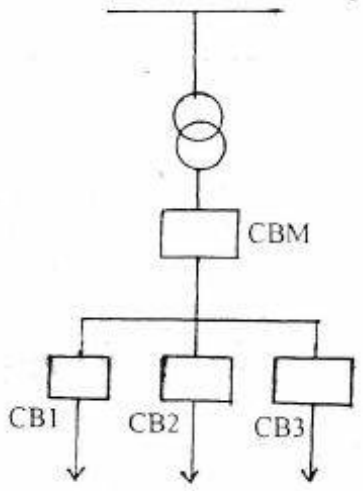
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the human factors in rural development? Explain each. [8]
2. What is the current scenario of electrification in rural Nepal? Discuss with issues, possible improvement and benefits of existing rural electrification. [8]
3. Write about the mechanical and electrical components of microhydropower plant. Calculate the efficiency of a microhydropower plant having a discharge of 120liter/sec a net head of 132m and power output of 600KW. [6+2]
4. Mention the possible alternative energy sources for rural electrification. Describe any one of them in brief with its systematic representation, components description, advantages and disadvantages. [0.5+1.5+4+2]
5. Calculate SAIFI, SAIDI, CAIDI and ASAI of the system given below. The number of tripping and trip duration are given for one year period. [8]

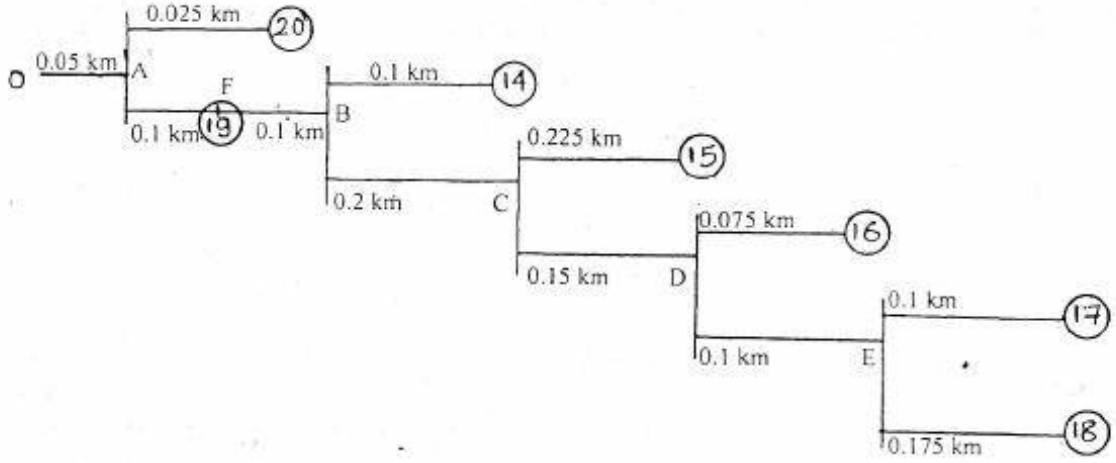
SAIFI = No. of trip * allocated consumer / Total



Feeder Breaker	No. of trip	Trip duration (HB)	No. of customers
CBM	0	0	800
CB1	90	200	200
CB2	150	175	300
CB3	300	250	500

6. Describe the impacts and mitigation measures of hydropower plant on socio-economic and culture environment. [8]

7. Find the line voltage at point "18". The loads at different points and the span length is given in the load flow diagram. Line voltage at point "o" is 400 V; impedance is 0.6091 ohm/km. [8]



8. Write about single phase or three phase selection criteria of distribution system. With suitable example explain how transformer installation point is determined? [4+4]

9. What are the various types of fault that occurs in RE network? Discuss how they can be protected. [8]

10. Write short notes on: [4+4]

    i) Load Management
    ii) Inventory Management

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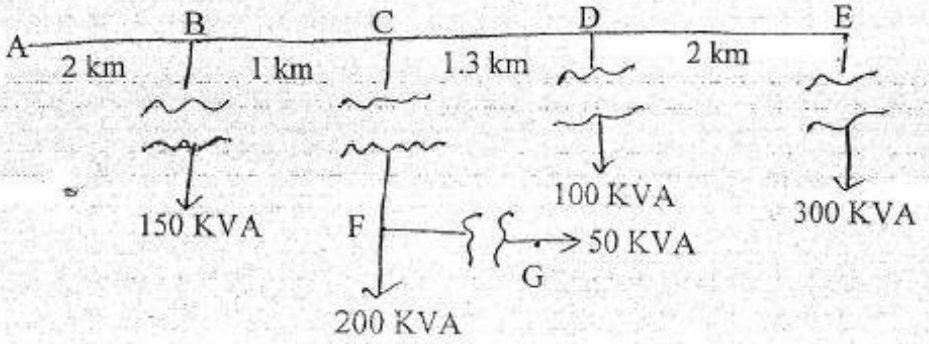
IMB TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain why end use promotion is a necessary for micro hydro plants and community based rural electrification entities. [8]
2. What is society? What are the social factors in rural development? [8]
3. Describe the impact of a hydropower plant on physical environment and suggest probable mitigation measures. [8]
4. What are the parameters that determine quality of electricity supply and what are their tolerance levels as per electricity regulation, Nepal. [4]
5. Calculate plant factor of a power plant with installed capacity of 90 kW and annual generation of 675 MWh. [4]
6. Compare the power loss and voltage drop in two cases: (a) uniformly increasing load (b) Load connected at far end. [8]
7. A four segment feeder is shown in figure below. The K_{drop} factor of the line segment is: $K_{drop} = 0.0002691$. Determine the % voltage drop from point A to E. [8]



8. An 11 kV substation has a peak load of 4500 kW and annual energy of 25 GWh. Find actual energy loss per day if the peak power loss is 270 kW. [8]
9. Explain different types of energy metering and their application areas with neat sketch. [8]
10. How can voltage drop in the rural electrification network be minimized? [8]
11. With an example, prove that there is saving in kw if the unbalanced load is changed to balance load. [8]

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16 B TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Write about the energy scenario of Nepal? Write your views on energy as the development accelerator in modern society? [8]

2. Briefly discuss about components of solar system in rural electrification. [8]

3. Following demands is collected after energy demand survey in Khadgakot-3, Gulmi.

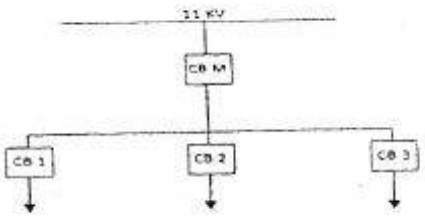
S.N.	possible peak load	No. of Households
1	500 Watt	15
2	300 Watt	10
3	250 Watt	10
4	150 Watt	20
5	100 Watt	30

Considering 15% Distribution loss,

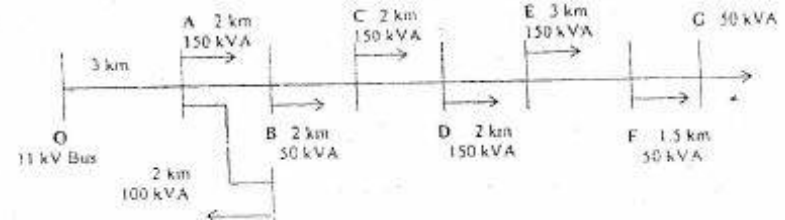
a. Design your own transformer Sizes and Transformer Numbers.
b. Find the size of HT Fuses for your design.
c. Find the Size of LT Fuses For your design.
d. Write your idea on how the distribution loss can be minimizing in this village? [8]

4. Calculate reliability indices: SAIFI, SAIDI, CAIDI of the distribution system as shown in the diagram below. The number of tripping and trip duration are given for a period of one year. [6]

CBs	No. of Trips	Duration of Trip	No. of Customers
CB M	7	2	7500
CB 1	101	125	2200
CB 2	75	211	2100
CB 3	51	111	3200



5. Compute percentage voltage drop at longest end point G of the following distribution system of 20 square mm conductor assuming kVA-km 4110 at 6% voltage regulation for the system and diversity factor 2.5. [8]



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6. The demand of a small Rural House is as follows, [4+2+2]

S.N.	Name	Nos.	Watt	Operation Hours /Day	Remarks
1	LED	8	7	5	AC Load
2	Radio	1	5	15	AC Load
3	TV	1	100	3	AC Load
4	FAN	1	60	3	AC Load

Find the Following parameters,

a. Total energy required in a day.
b. Considering connected load as the peak load of individual house, find the peak load of overall system for 35 similar households.
c. Considering the same demands for another 35 households, find the size of your micro hydro plant considering overall power loss of 35% in generation, transmission and distribution

7. Consider a distribution network project involving an equal investment of $51,000 at the beginning of each year over 4 years, starting today, with a discount rate of 10%. Find its present value. [5]

8. What do you mean by load management? Discuss about its advantages. [1+5]

9. Why it is necessary to maintain the inventory? [8]

10. Write short notes on: (any three) [5+5+5]

a. Industrialization and Urbanization
b. Distribution Transformer Protection
c. Conditioning Monitoring
d. End use of Electricity

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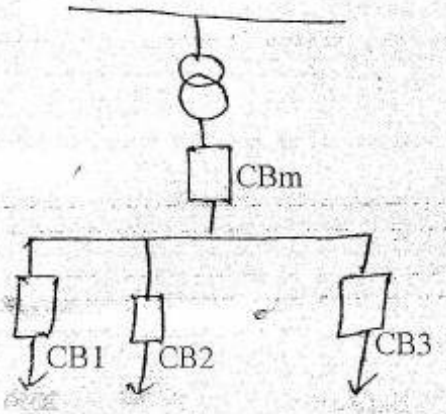
14B TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE72502)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>**Full Marks**</u>.*
- ✓ *Assume suitable data if necessary.*

1. Define livelihood and explain some of its determinants. [8]
2. How can the electricity improve socio-economic status of people in rural community? Discuss. [8]
3. Explain grid based electrification with a neat sketch. [4]
4. Find out the overall efficiency of a hydropower plant with installed capacity of 50 kW, design discharge of 324 m^3/hr and design head of 350 ft. [4]
5. Define components of a solar home system and explain the role of each component. [8]
6. Why are the reliability indices important for any distribution network? Calculate SAIDI, SAIFI, CAIDI and ASAI for the given system. The number of trip and trip duration are given for one year period. [8]



Feeder Breaker	No. of Trip	Trip Duration (hrs)	Number of customers
CBM	0	0	600
CB1	10	150	200
CB2	80	200	300
CB3	20	320	150

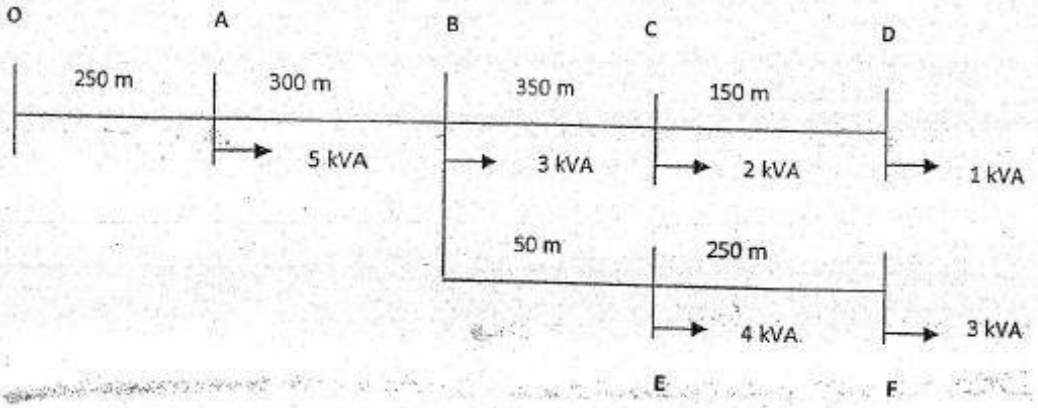
7. Explain the different components of wind power generation system. Point out the factors affecting the power output from the wind turbine. [8]
8. Explain the protection system of an 11/0.4kV-100 kVA distribution transformer with a neat sketch and suggest appropriate ratings of protective devices. [4]
9. Calculate the discounted payback period of a project with following details. [4]

   Cost of capital = 10%; Initial investment = Rs. 4,300,000.00;

   Project life = 7 years; Annual cash flow = Rs. 1,235,000.00

10. Find Line voltage at point 'F'. The loads at different nodes and the span lengths are given in the load flow diagram. The line voltage at node 'O' and conductor specifications are as follows. [8]

Line voltage at node 'O' = 400 V; r = 0.4 ohm/km; x = 0.3 ohm/km



11. List out the faults that may occur in distribution transformer and give out the protective measures. [8]

12. Discuss demand side management. [8]

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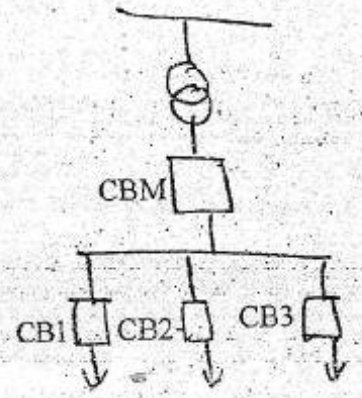
148 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE72502)*

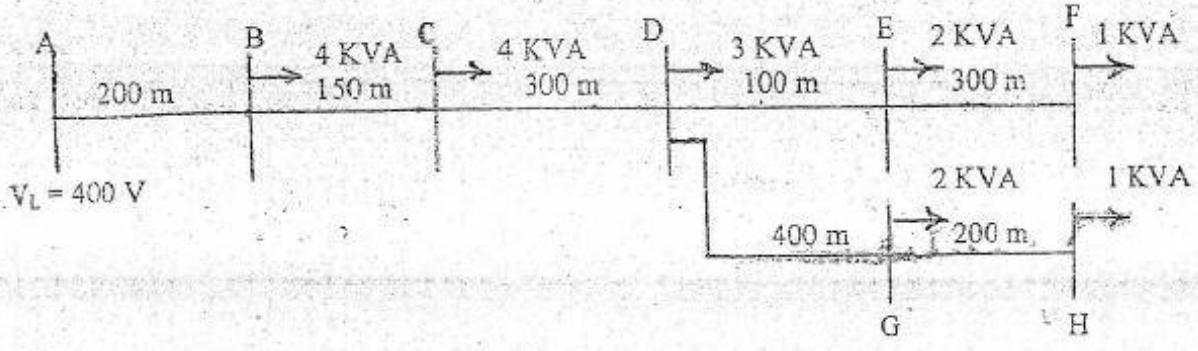
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the social factors in rural development? [8]
2. Discuss the role of electricity in rural development. [8]
3. Calculate SAIFI, SAIDI, CAIDI and ASAI of the system given below. The number of trappings and trip duration are given for one year period. [8]



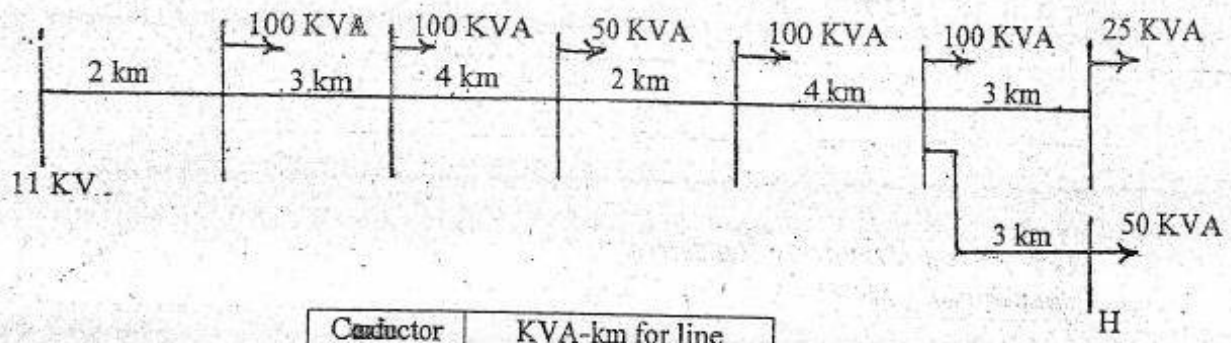
Feeder Breaker	No. of trip	Trip duration (HB)	Number of customer
CBM	0	0	600
CB1	10	150	200
CB2	50	380	300
CB3	80	500	100

4. Derive the power equation of wind turbine and explain the parameters influencing power generation from a wind turbine. [8]
5. Describe the impact of hydropower on biological environment and suggest probable mitigation measures. [8]
6. Calculate Line voltage at point 'G'. The specific resistance and specific reactance of conductor are 0.4 and 0.3 ohm per km respectively. Line voltage at point 'A' is 400 v. The line length is given in meters. [8]



(48)

7. Find out the % voltage drop at point 'H' using KVA-km conductor loading method. The conductor size is 30 mm^2 Al, diversity factor is 2.5 and % voltage regulation limit is 5% [8]



Conductor	KVA-km for line regulation for 11 KV overhead line		
mm^2	5%	6%	7%
20	3630	4410	5210
30	5170	6270	7380

8. A 11 KV substation has a peak load of 3000 kW and annual energy of 15768 MWh. Find actual energy loss per day if the peak power loss is 150 kW. [8]
9. Define the types and causes of faults occurring in rural electrification network and suggest the preventive measures to be taken for minimizing fault occurrence. [8]
10. Define inventory management and factors affecting the inventory. [8]

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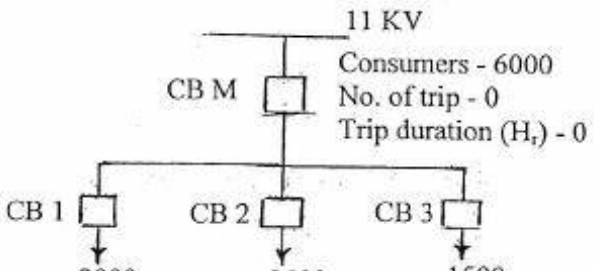
17B TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I) (EE725)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. Define Industrialization and Urbanization. Discuss effect of industrial revolution. [8]
2. Explain impacts of rural electrification in rural development. [8]
3. What are the main targets of National water plan of 2017 and 2027? Discuss weather it is possible to achieve that target by Nepal in 2017. [8]
4. Calculate the actual electric power that can be produced by a hydropower plant, if the available discharge (Q) is 252 M^3/hr, the head (H) available is 100 m and the overall efficiency (η) of the plant is 60%. [5]
5. Calculate CAIDI and ASAI of a distribution system given below. The no. of tripping and trip duration are given for 1 year period. [9]



Consumers	2000	2500	1500
No. of trip	100	75	50
Trip duration (H_r)	150	280	140

6. Find out the optimum transformer installation point. The coordinates and the loads of different load point are given in the table below: [10]

Load point	Coordinate		Load (KVA)
	X	Y	
1	3	9	10
2	2	10	2
3	4	2	3
4	8	3	2
5	1	8	5
6	11	5	1
7	10	7	4
8	9	11	2
9	7	4	6
10	5	6	2
11	6	1	2

(2)

7. Discuss the impact of hydropower on physical and biological environment and suggest probable mitigation measures. [8]
8. What are the factors to be considered for the selection of LT route and discuss about the protection system at distribution transformer. [8]
9. Define condition monitoring and explain its importance in electric network maintenance. [8]
10. A distribution station has a peak load of 200 KW and total annual energy of 1.5 GWh. The peak power loss is 12 kW. Find: [8]
    i) Loss factor
    ii) Actual loss
    iii) Energy loss during 1 year period

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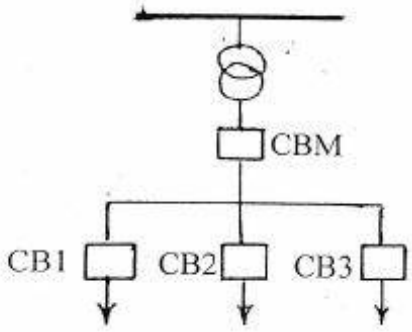
2B TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification ***(Elective I) (EE72502)***

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Urbanization is closely linked with industrialization. Discuss. [8]
2. Electricity improves the socio-economic status of the rural community. Discuss. [8]
3. What are the components of a solar home system? Describe the role of each component. [16]
4. Calculate SAIFI, SAIDI and ASAI of the system given below. The number of tripping and trip duration are given for one year period. [8]

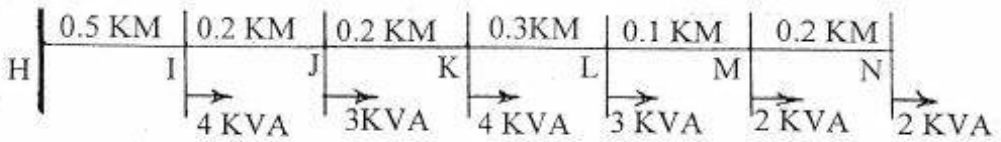


Feeder breaker	No. of trip	Trip duration (HB)	No. of customers
CBM	0	0	900
CB 1	0	0	400
CB 2	250	150	300
CB 3	275	450	200

5. Describe the impact of hydro power on socio-cultural environment and suggest probable mitigation measures. [8]
6. Find out the 'X' and 'Y' coordinate (optimum point) for transformer installation) [8]

Load point	a	b	c	d	e	f	g	h	i
'X'	1	2	2	4	6	8	9	9	10
'Y'	10	8	3	5	6	9	4	2	7
Load (KVA)	2	1	3	4	25	5	3	2	7

7. Calculate phase voltage at point (node) 'M'. The conductor specifications are as follows: r = 0.5 Ohm/km; X = 0.3 Ohm/km, Line voltage V_L at H = 400V. [8]



8. Define: (a) Load shedding (b) Peak load tariff (TOD). [8]
9. Define correction, corrective action and preventive action with an example. [8]

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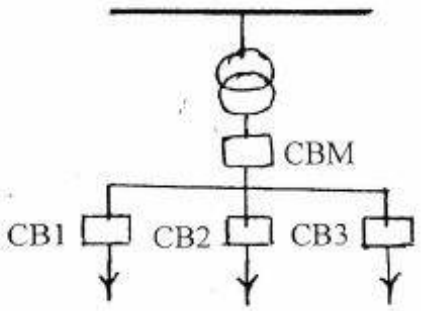
27B TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Rural Electrification *(Elective I)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is culture? What are the cultural factors in rural development? [8]
2. What does the end use of electricity mean? Describe the key components of productive end use of electricity. [8]
3. What are the mechanical and electrical components of a Micro Hydro? Describe the role of each component. [16]
4. Calculate CAIDI and ASAI of the system given below. The number of trippings and the trip duration are given for 1 year period. [8]

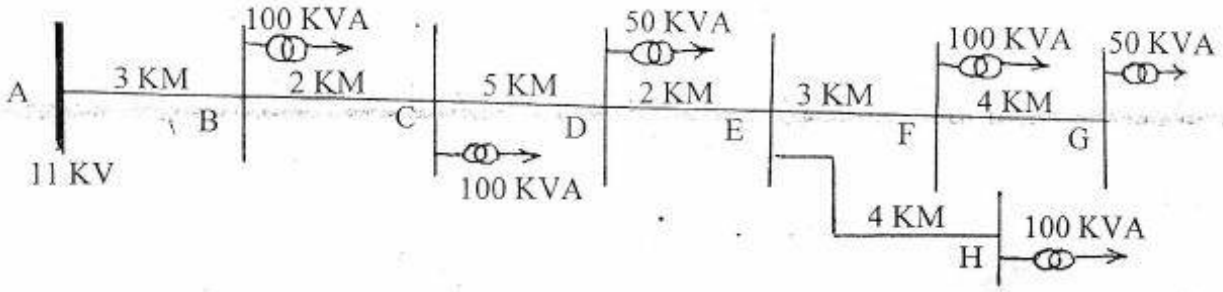


Feeder Breaker	No. of Trip	Trip duration (HB)	No. of customers
CBM	0	0	800
CB1	90	200	200
CB2	150	175	300
CB3	300	250	500

5. Describe the impact of hydropower on physical environment and probable mitigation measures. [8]
6. Find out the 'X' and 'Y' coordinate (optimum point) for transformer installation. [8]

Load Point	'X'	'Y'	Load (KVA)
a	1	11	1
b	1	9	20
c	3	7	2
d	3	4	3
e	4	2	2
f	5	7	4
g	8	3	5
h	10	8	3
i	11	1	2

7. Find out the % voltage drop at point 'H' using KVA-km conductor loading method. The conductor size is 20 mm^2A1. Diversity tactor is 2 and % voltage regulation limit is 5%. [8]



Conductor	KM-KVA for line regulation for 11 KV overhead line		
mm^2	5%	6%	7%
20	3630	4410	5210
30	5170	6270	7380

8. A distribution station has a peak load of 2000 KW and total annual energy of 10 GWh. The peak power loss is 100 KW. Find: [8]
   a) Load factor
   b) Loss factor
   c) Actual power loss

9. Define: [8]
   a) Condition monitoring
   b) Inventory management

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