Duration: - 3 Hrs **Max. Marks: - 80**

Note: - 1. Question number 1 is compulsory.

2. Attempt any Three questions out of remaining.

3. Assume any data if necessary and justify the same.

Q1 Attempt any Four. **(20)**

a) Explain SLD in details.

b) Explain soft starters

c) State elements of monitoring and targeting

d) What is Bench Marking and what are its type.

e) Explain power factor improvement and its cost benefits

Q2 A) Explain electrical load management. **(10)**

B) Explain lead acid battery and its advantages

Q3 A) The details of the load which are connected to a distribution transformer in a plant are as follows. **(10)**

Type of load	Load in KW	Efficiency	Power factor	Load factor	Diversity Factor
Washing Plant	500	0.8	0.75	0.8	0.7
Cutting shop	250	0.85	0.7	0.6	0.5
Misc load	200	0.85	0.85	0.5	0.5
Machine shop	300	0.8	0.75	0.75	0.7

Calculate the capacity of distribution transformer feeding a plant and draw SLD showing relevant metering and protections

B) Explain need and types of Energy Audit. **(10)**

Q4 A) A room measuring 30*15*4m is to be illuminated at 200lux. Find the number of lamps required. Mention all the assumptions. Draw physical layout. **(10)**

B) Explain Energy efficient controls in lighting **(10)**

Q5 A) Explain important provisions of Energy Conservation Act. **(10)**

B) Explain cable management systems **(10)**

Q6 A) A 415V, 0.8 pf, 20HP, 3 phase, 0.85 efficiency, 1440rpm Delta connected induction motor is to be connected to a MCC by a cable of length 15m. The cable is running with other cables. Ambient temp is 45 deg Celsius, Fault level at that point is 20KA. Select the cable and its size of conductor. Assume grouping factor of 0.86. State various assumptions made.

B) Explain different types of distribution systems. **(10)**

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Data for Illumination Design problems

K	R_C = 0.7			R_C = 0.5			R_C = 0.3		
	R_W = 0.5	R_W = 0.3	R_W = 0.1	R_W = 0.5	R_W = 0.3	R_W = 0.1	R_W = 0.5	R_W = 0.3	R_W = 0.1
0	0	0	0	0	0	0	0	0	0
0.6	0.43	0.39	0.36	0.42	0.38	0.36	0.41	0.38	0.36
0.8	0.45	0.41	0.38	0.44	0.40	0.38	0.43	0.40	0.38
1.00	0.51	0.47	0.44	0.55	0.47	0.44	0.49	0.46	0.40
1.25	0.55	0.51	0.49	0.53	0.50	0.48	0.52	0.50	0.48
1.50	0.57	0.54	0.52	0.56	0.53	0.51	0.54	0.52	0.50
2.00	0.61	0.58	0.56	0.59	0.57	0.55	0.57	0.56	0.54
2.50	0.63	0.61	0.59	0.61	0.59	0.57	0.59	0.58	0.56
3.00	0.65	0.63	0.61	0.63	0.61	0.59	0.61	0.59	0.58
4.00	0.67	0.65	0.63	0.64	0.63	0.62	0.62	0.61	0.59
5.00	0.68	0.67	0.65	0.65	0.64	0.63	0.63	0.62	0.61

Lamp Data			
Sr. No.	**Type of Lamp**	**Wattage**	**Lumen output**
1.	**Fluorescent (T8/T5)**	**18 (Halo phosphate)**	**1015**
		36 (Halo phosphate)	**2450**
		18 (82/84/86)	**1300**
		36 (82/84/86)	**3250**
		28 (T5)	**2800**
2.	**CFL**	**9**	**600**
		11	**760**
		13	**920**
		18	**1200**

TABLE-36

Correction factors for groups of more than three single-core cables or more than one multicore cables or more than one multicore cables

Multicore cables: (Factors to be applied to the values for one cable)	Number of cables								
	2	3	4	5	6	7	8	9	10
	0.80	0.70	0.65	0.60	0.57	0.52	0.48	0.45	0.43

NOTES:
1. These factors are applicable to groups of cables all of one size equally loaded, including groups bunched in more than one plane
2. Where, spacing between adjacent cables exceeds twice their overall diameter, no reduction factor need be applied

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TABLE 14
IEE-Table 9D2
Current-carrying capacities and associated voltage drops for twin and multicore p.v.c. -insulated cables, non-armoured (copper conductors)

Conductor operating temperature : 70°C

Conductor Cross sectional area	Installation methods A to C †of Fig. 1 ('Enclosed')				Installation methods E to H of Fig. 1 ('Clipped direct')				Installation method K of Fig. 1 ('Defined conditions')			
	One twin cable With or without protective conductor single-phase a.c. or d.c.		One three-core cable with or without protective conductor or one four-core cable, three phase		One Twin cable With or without protective conductor single-phase a.c. or d.c.		One three-core cable with or without protective conductor or one four-core cable, three phase		One Twin cable With or without protective conductor single-phase a.c. or d.c.		One three-core cable with or without protective conductor or one four-core cable, three phase	
	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre
1	2	3	4	5	6	7	8	9	10	11	12	13
mm²	A	mV	A	mV	A	mV	A	mV	A	mV	A	mV
1.0	14	42	12	37	16	42	13	37	-	-	-	-
1.5	18	28	16	24	20	28	17	24	-	-	-	-
2.5	24	17	21	15	28	17	24	15	-	-	-	- FLAT
4	32	11	29	9.2	36	11	32	9.2	-	-	-	- CABLES
6	40	7.1	36	6.2	46	7.1	40	6.2	-	-	-	- ONLY
10	53	4.2	49	3.7	64	4.2	54	3.7	-	-	-	-
16	70	2.7	62	2.3	85	2.7	71	2.3	-	-	-	-
25	79	1.8	70	1.6	108	1.8	90	1.6	114	1.8	95	1.6
35	98	1.3	86	1.1	132	1.3	115	1.1	139	1.3	122	1.1
50	-	-	-	-	163	0.92	140	0.81	172	0.92	148	0.81
70	-	-	-	-	207	0.65 0.64	176	0.57	218	0.65 0.64	188	0.57
95	-	-	-	-	251	0.48 0.46	215	0.42	265	0.48 0.46	227	0.42
120	-	-	-	-	290	0.40 0.36	251	0.34	306	0.40 0.36	265	0.34
150	-	-	-	-	330	0.32 0.25	287	0.29	348	0.32 0.25	302	0.29
185	-	-	-	-	380	0.29 0.23	330	0.24	400	0.29 0.23	348	0.24
240	-	-	-	-	450	0.25 0.18	392	0.20	474	0.25 0.18	413	0.20
300	-	-	-	-	520	0.23 0.14	450	0.18	548	0.23 0.14	474	0.18
400	-	-	-	-	600	0.22 0.11	520	0.17	632	0.22 0.11	548	0.17

CORRECTION FACTORS

FOR AMBIENT TEMPERATURE	25°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C
Ambient temperature								
Correction factor	1.06	0.94	0.87	0.79	0.71	0.61	0.50	0.35

TABLE 15
IEE-Table 9D3
Current-carrying capacities and associated voltage drops for twin and multicore armoured p.v.c. -insulated cables (copper conductors).

Conductor operating temperature : 70°C

Conductor cross sectional area	Installation method E, F and G † of Table 11 ('Clipped direct')				Installation method K of Table 11 ('Defined conditions')			
	One twin cable single phase a.c. or d.c.		One three - or- four core cable three-phase		One twin cable single phase a.c. or d.c.		One three - or- four core cable three-phase	
	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre
1	2	3	4	5	6	7	8	9
mm²	A	mV	A	mV	A	mV	A	mV
1.5	20	29	18	25	-	-	-	-
2.5	29	18	24	16	-	-	-	-
4	37	12	31	9.6	-	-	-	-
6	48	7.4	41	6.3	50	7.3	42	6.3
10	66	4.3	56	3.8	69	4.3	58	3.8
16	86	2.7	73	2.3	90	2.7	77	2.3
25	115	1.8	97	1.6	121	1.8	102	1.6
35	142	1.3	119	1.1	149	1.3	125	1.1
50	168	0.92	147	0.81	180	0.92	155	0.81
		a.c. d.c.				a.c. d.c.		
70	209	0.65 0.64	180	0.57	220	0.65 0.64	190	0.57
95	257	0.48 0.46	219	0.42	270	0.48 0.46	230	0.42
120	295	0.40 0.36	257	0.34	310	0.40 0.36	270	0.34
150	337	0.32 0.25	295	0.29	355	0.32 0.25	310	0.29
185	390	0.29 0.23	333	0.24	410	0.29 0.23	350	0.24
240	461	0.25 0.18	399	0.20	485	0.25 0.18	420	0.20
300	523	0.23 0.14	461	0.18	550	0.23 0.14	475	0.18
400	589	0.22 0.11	523	0.17	620	0.22 0.11	550	0.17

CORRECTION FACTORS

FOR AMBIENT TEMPERATURE	25°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C
Ambient temperature								
Correction factor	1.06	0.94	0.87	0.79	0.71	0.61	0.50	0.35

[TURN OVER

TABLE 20
IEE-Table 9K1
Current-carrying capacities and associated voltage drops for single-core p.v.c. -insulated cables, non-armoured, with sheath (Aluminium conductors)

Conductor operating temperature : 70°C

Cross sectional area of conductor	Installation methods A to C † of Table 11 ('Enclosed')					Installation methods E to H of Table 11 ('Clipped direct')					Installation method J of Table 11 ('Defined conditions')					
	2 Cables, single-phase a.c., or d.c.			3 or 4 cables three-phase a.c.		2 Cables, single-phase a.c., or d.c.			3 or 4 cables three-phase a.c.		Flat or vertical (2 cables, single-phase a.c., or d.c. or 3 or 4 cables three-phase)				Trefoil (3 cables three-phase)	
	Current carrying capacity	Volt drop per ampere per metre		Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre		Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre			Current carrying capacity	Volt drop per ampere per metre
		a.c.	d.c.				a.c.	d.c.				1 ph	d.c.	3 ph.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
mm²	A	mV	mV	A	mV	A	mV	mV	A	mV	A	mV	mV	mV	A	mV
16	60	4.5	4.5	52	3.9	72	4.5	4.5	65	3.9	-	-	-	-	-	-
25	78	2.9	2.8	67	2.5	94	2.8	2.8	85	2.5	-	-	-	-	-	-
35	96	2.1	2.0	83	1.8	115	2.1	2.0	105	1.8	-	-	-	-	-	-
50	120	1.6	1.5	100	1.4	143	1.5	1.5	123	1.3	155	1.5	1.5	1.34	140	1.3
70	150	1.2	1.0	125	1.0	181	1.1	1.0	156	0.93	190	1.1	1.0	0.95	170	0.90
95	175	0.93	0.75	150	0.80	223	0.77	0.75	192	0.69	235	0.80	0.75	0.72	205	0.67
120	205	0.80	0.60	175	0.70	261	0.62	0.60	225	0.56	275	0.65	0.60	0.60	235	0.54
150	235	0.73	0.49	200	0.64	298	0.51	0.49	259	0.48	320	0.55	0.49	0.51	270	0.45
185	-	-	-	-	-	345	0.42	0.39	290	0.40	376	0.46	0.39	0.45	310	0.37
240	-	-	-	-	-	411	0.34	0.29	361	0.34	440	0.43	0.29	0.43	370	0.30
300	-	-	-	-	-	476	0.29	0.23	419	0.30	510	0.38	0.23	0.39	435	0.25
380	-	-	-	-	-	554	0.26	0.19	465	0.28	589	0.35	0.19	0.37	490	0.22
480	-	-	-	-	-	643	0.23	0.15	541	0.26	677	0.32	0.15	0.34	570	0.20
600	-	-	-	-	-	737	0.21	0.12	616	0.24	776	0.30	0.12	0.33	649	0.18

CORRECTION FACTORS

FOR AMBIENT TEMPERATURE

Ambient temperature	25°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C
Correction factor	1.06	0.94	0.87	0.79	0.71	0.61	0.50	0.35

TABLE 21
IEE-Table 9K2
Current-carrying capacities and associated voltage drops for twin and multicore armoured p.v.c. -insulated cables, non-armoured (Aluminium conductors)

Conductor operating temperature : 70°C

Conductor cross sectional area	Installation method E, to H † of Table 11 (Clipped direct)				Installation method K of Table 11 ('Defined conditions')			
	One twin cable single phase a.c. or d.c.		One three - or- four core cable, three-phase		One twin cable, single phase a.c. or d.c.		One three - or- four core cable, three-phase	
	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre	Current carrying capacity	Volt drop per ampere per metre
1	2	3	4	5	6	7	8	9
mm²	A	mV	A	mV	A	mV	A	mV
16	62	4.5	53	3.9	65	4.5	55	3.9
25	82	2.9	70	2.5	86	2.9	74	2.5
35	102	2.1	86	1.8	107	2.1	91	1.8
50	120	1.5	106	1.3	125	1.5	110	1.3
70	150	1.1	133	0.93	158	1.1	139	0.93
95	185	0.79	163	0.68	195	0.79	172	0.68
120	-	-	190	0.54	-	-	200	0.54
150	-	-	217	0.45	-	-	227	0.45
185	-	-	247	0.37	-	-	260	0.37
240	-	-	296	0.29	-	-	311	0.29
300	-	-	340	0.25	-	-	358	0.25

CORRECTION FACTORS

FOR AMBIENT TEMPERATURE

Ambient temperature	25°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C
Correction factor	1.06	0.94	0.87	0.79	0.71	0.61	0.50	0.35

Duration: 3hrs **[Max Marks:80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1		Attempt any **FOUR** from following.	[20]
	a	Explain the Laws of illumination. What is horizontal and vertical illumination?	
	b	What is DMX control?	
	c	What are the requirements of a street lighting at a junction?	
	d	Explain with neat diagram working principle and operation of Induction lamp.	
	e	Explain briefly circadian rhythm.	
2	a	Discuss the various optical control techniques.	[10]
	b	Illustrate different means and ways to minimize the glare in indoor lighting design.	[10]
3	a	With neat diagram, explain the construction, working and features of discharge lamps.	[10]
	b	Compare the design factors to be considered for industrial area and hospital lighting system.	[10]
4	a	Illustrate how daylight integration can be done with artificial lighting in offices and educational institutes?	[10]
	b	With neat block diagram, explain basic driver circuit for LED lamp. Explain different driver circuits for LED lighting system.	[10]
5	a	Compare the design factors to be considered for indoor sports and outdoor sports lighting system.	[10]
	b	Explain design of Lighting Control Schemes for energy efficient lighting system.	[10]
6	a	Explain tunable white lighting technology with neat diagram and also mention its applications.	[10]
	b	Write short notes on human centric lighting	[10]

****

Time: (3 Hours) **Total Marks: 80**

Note:
1. **Question No. 1 is compulsory**.
2. Attempt any **THREE** out of the remaining **FIVE** questions.
3. Assume suitable data if necessary.

Q. 1. Answer **any FOUR** of the following: **(20)**

(a) Discuss on : pillars of Environmental Management.

(b) Elaborate the ISO 14001 EMS Model for Municipalities.

(c) Unawareness or ignorance of environmental protection will lead to detrimental consequence comment. Justify the statement.

(d) Define Environmental Objective as per ISO 14001

(e) Explain the various keys components of EMS.

Q. 2. (a) Write notes on the following : **(10)**
a) Applications of Environmental Management System.
b) ISO 14001& ISO 14010

(b) What are the challenges of Environmental Management? **(10)**

Q. 3. (a) How is CSR related to Environmental Management? Explain with an example. **(10)**

(b) What are the guidelines to conduct and Environmental audit? **(10)**

Q. 4. (a) What is Total Quality Environment Management Concept? **(10)**

(b) Discuss on factors destroying the Environment with example. **(10)**

Q. 5. (a) Write short note on Loss of Biodiversity as related to global environmental concerns. **(10)**

(b) Discuss the key success factors for applied to almost all the operation for EMS implementation. **(10)**

Q. 6. **Answer the following:-** **(20)**

(a) Discuss on 5 biggest environmental problems of year 2023.

(b) Explain limiting factors and carrying capacity as related to Ecosystems.

(c) How does EMS help in improving environment quality?

(d) Discuss on Environmental Issues related to Indian Context.

(Time: 3 Hours) **Total Marks – 80**

N.B.:- (1) Question No.**1** is compulsory.
(2) **Attempt** any **three** questions out of remaining **five** questions.
(3) Assume necessary data wherever necessary.

1. Attempt the following 20
   a) Define failure rate and repair rate.
   b) State characteristics of load.
   c) State LOLE, LOEE and EIR
   d) Describe peak load forecasting.

2. a) Describe important points in long term load forecasting. 10
   b) Explain the weather forecast model. 10

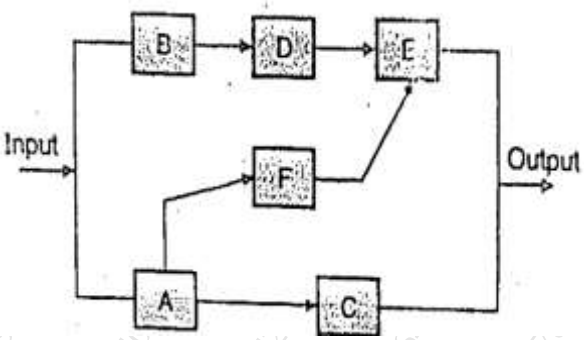
3. a) Describe frequency and duration method. 10
   b) A system is having four components with individual reliability of 0.92, 0.94, 0.96, 0.98 and 0.95 each. Calculate reliability and unreliability of a system when the components are connected in i) series and ii) parallel. 10

4. a) Define following index: 10
      a) System Average Interruption Frequency Index
      b) System Average Interruption Duration Index
      c) Customer Average Interruption Duration Index
      d) Customer Total Average Interruption Duration Index
      e) Customer Average Interruption Frequency Index

   b) Consider a system containing five units of 40MW each with FOR=0.03. Prepare the capacity outage table for the system. Find Loss of Load Expectation and risk factor if the annual peak load is 180 MW and base load if 40% of peak load. 10

5. a) Describe Reliability evaluation of radial distribution Feeder system 10

   b) Calculate reliability evaluation using conditional probability approach in the following system with each component reliability 0.99. 10



6. Write short note on any two 20
   a) Markov process with two state model.
   b) Capacity Outage Probability table
   c) renewable energy and reliability of power system

****

Duration: 3hrs **[Max Marks: 80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

Q. 1		Solve **ANY FOUR** questions from following.	**20**
	a)	With neat diagram, explain the operation of integrating type photometer.	
	b)	What are the various optical control techniques for interior lighting.	
	c)	Specify exterior lighting design considerations for sports stadium.	
	d)	Explain briefly circadian rhythm and human centric lighting.	
	e)	Discuss the various driver circuits used for LED system.	
Q. 2	**a)**	Explain with neat diagram working construction and operation of HID lamp.	**10**
	b)	Explain LED lamp components. State advantages and disadvantages of LED lighting.	**10**
Q. 3	**a)**	Discuss briefly the design factors to be considered residential area lighting.	**10**
	b)	Design lighting scheme for an industrial area measuring 50 m X 20 m. The ceiling height is 7.0 m. The area is to be illuminated to 150 Lux using industrial high bay luminaires with lumen output of 20000. Draw the lighting layout indicating spacing between luminaires. Specify assumptions and justification.	**10**
Q. 4	**a)**	Draw and explain the different luminaire layouts for major road lighting.	**10**
	b)	Design the lighting scheme for a major road having two-way heavy traffic. The specifications are as follows: Total width of the road = 20 meters; width of the divider = 1.0 m and length of the road = 2.5 km. Use 250 W LED streetlights with 25000 lumen output. Find the number of lamps, luminaires, spacing required and arrangement of lamps. Specify assumptions with justification.	**10**
Q. 5	**a)**	Explain daylight integration with artificial lighting for energy efficient lighting system.	**10**
	b)	Discuss the design features of solar powered LED street lighting system.	**10**
Q. 6	**a)**	Use of lighting control techniques increases efficiency of lighting system. Justify.	**10**
	b)	Explain tunable white lighting technology with neat diagram and also mention its applications.	**10**

———

Time: 3 hour **Max. Marks: 80**

N.B.(1) Question number 1 is Compulsory.
(2)Attempt Any Three Questions From Remaining 5 Questions.
(3) Answers to Sub questions Should be grouped and written together.

Q1(20 Marks)	**Solve all Questions**	**5 marks each**
A	Explain various parameters which limit loading capabilities of transmission line.	
B	What are the objectives of voltage and phase angle regulators	
C	Explain in brief the basic types of FACTS controllers	
D	Write short note on ideal Load compensator.	

Q2.(20 Marks)		**10 marks each**
A	Explain power factor Correction in single phase AC system.	
B	Explain variable impedance type series compensation(TSSC)	

Q3.(20 Marks)		**10 marks each**
A	Explain the Thyristor Control Phase Angle Regulator	
B	Explain the fixed Capacitor Thyristor controlled Reactor (FC-TCR) in detail along with operating Vl characteristics.	

Q4.(20 Marks)		**10 marks each**
A	Explain UPFC in details with its phasor Diagram	
B	Explain switching converter VAR generator	

Q5.(20 Marks)		**10 marks each**
A	Compare HVDC with FACTS.	
B	Explain the shut compensation by synchronous voltage source	

Q6.(20 Marks)		**10 marks each**
A	Explain power flow and dynamic stability considerations of transmission interconnection.	
B	Explain Midpoint voltage regulation of line segmentation.	

****

Duration 3hrs **Total Marks 80**

NB: 1) Question No. 1 is Compulsory.
2) Attempt any three Questions out of remaining five Questions.
3) Assume suitable data if necessary and justify the same.

Q1. Answer any four of the following questions

	A)	Distinguish between power outages and interruptions	**05**
	B)	State objectives of shunt compensator	**05**
	C)	Explain different causes of voltage and current harmonics.	**05**
	D)	Explain series connection of active filter.	**05**
Q2	A)	Comment how harmonics affect the rotating machines	**10**
Q2	B)	Explain need of transmission line interconnection. Also explains factors limiting the transmission line loading capacity.	**10**
Q3	A	Classify in detail the power filter used for harmonic elimination and explain any one with advantages and disadvantages,	**10**
Q3	A)	Enlist common power quality issues. Explain any five of them.	**10**
Q4	A)	Explain various basic FACTS controllers on the basis of their connection with needful diagram. Give One example in each categories.	**10**
Q4	B)	Explain the operating principle of the Thyristor Controlled Reactor (TCR) in detail .	**10**
Q5	A)	Explain the Thyristor controlled phase angle regulator (TCPAR).	**10**
Q5	B)	With the neat phasor diagram explain power factor compensation using capacitor.	**10**
Q6	A)	Explain switching converter type series compensation (SSSC).	**10**
Q6	B)	Explain Switching converter type VAR generator. Explain its basic operating principal	**10**

****

(Duration: 3 Hours) **Total Marks: 80**

NOTE:

1. **Question No.1 is Compulsory**.
2. Answer any three out of remaining five questions.
3. Assume any suitable data wherever required but justified the same.
4. Illustrate answer with sketches wherever required.

Q 1 Answer the following Questions. **[20]**

A. Why electrical drawings and plans are prepared

B. Why motor control centre are developed

C. Discuss the battery selection criterion for UPS application

D. Discuss the application of cumulative sum method application in industry

Q 2 a Explain how BLDC fans and energy efficient motors are energy efficient. **[10]**

Q 2 b How will you carry out energy auditing of variable speed drives. **[10]**

Q 3 a Discuss how benchmarking is an auditing tool. **[10]**

Q 3 b Discuss the sizing of bus bar and DG set. **[10]**

Q 4 a Discuss cable management and installation system. **[10]**

Q 4 b Discuss how the sizing of transformer is done for a given set of loads. **[10]**

Q 5 a Discuss the designing of electrical earthing system. **[10]**

Q 5 b Discuss the sizing and location of capacitors for power factor correction. **[10]**

Q 6 a Discuss how maximum demand controller is a tool for monitoring and targeting. **[10]**

Q 6 b Discuss the implementation of energy management system. **[10]**
