AIKTC/KRRC/SoET/ACKN/QUES/2018-19/ **Date:** _____

School: SoET-CBSGS **Branch:** ELECT. ENGG. **SEM:** VIII

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Design, Management and Auditing of Electrical Systems	EEC801		✓	02
2	Drives and Control	EEC802		✓	02
3	Power System Planning and Reliability	EEC803		✓	02
4	Elective- II Flexible AC Transmission System	EEE80X		✓	02
5					
6					

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

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

N.B.

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 a) State whether true or false and justify the same **(Any five)**

1. Variable Speed Drive (VSD) provides significant energy savings in case of variable torque load **(02)**
2. Individual compensation does not change the protection setting in the upstream side. **(02)**
3. Energy Efficient Motor is more compact than standard motor of the same rating. **(02)**
4. Air Circuit Breaker (ACB), Molded Case Circuit Breaker (MCCB) and Miniature Circuit Breaker (MCB) are an examples of an Air Insulated Switchgear (AIS). **(02)**
5. Specific Energy Consumption (SEC) is popularly use to analyze energy efficiency of plant. **(02)**
6. Decision of Correlation Color Temperature (CCT) of lamp depends upon the application for which illumination system is designed. **(02)**

Q.1 b) Illustrate advantages of busbar system in comparison with a cable system **(05)**

Q.1 c) List out energy saving opportunities in fans and blowers. **(05)**

Q 2 a) From the data given below, **(15)**

i. Draw the SLD showing the location of loads metering devices and various protective devices and their ratings.
ii. Calculate the kVA rating of transformer required for the loads.
iii. Specify the ratings of HT and LT (main) circuit breaker
iv. Suggest for which load, power factor improvement required and calculate capacitor bank required to improve power factor to 0.95.

Load No	kW Rating	LF	DF	Efficiency	PF	Phase
1	100	0.8	0.7	0.7	0.7	Three phase
2	350	0.85	0.7	0.8	0.85	Three phase
3	200	0.5	0.5	0.9	0.95	Single phase
4	400	0.55	0.4	0.9	0.80	Single phase

b) Enlist the desirable characteristics of Energy Audit Instruments **(05)**

TURN OVER

52D665BA610210D6637CEC2F494602A3

Q 3 a) A 50kW heater, 415V, 3ϕ, 50Hz connected to PCC length = 100m. Two other circuit is running in a cable tray. Ambient temperature is 40°C. Fault level is 20kA. Calculate and specify the cable required for the same. **(10)**

Sr. No	Type of Cable	Value of k (Cu)	Value of k (AL)
a)	PVC cable ≤ 300mm^2	115	76
b)	PVC cable > 300mm^2	103	68
c)	XLPE cable	114	92

b) Illustrate the need of UPS. What are the types of UPS? Illustrate the suitability of each with the help of suitable examples. **(10)**

Q 4 a) An 80HP motor is to operate at full load for 800hr/yr, half load 1800hr/yr, and to be switched off the rest of the time. Two motors are available **(10)**

Energy Efficient Motor	Efficiency at full load	0.92
	Efficiency at half load	0.90
Standard Motor	Efficiency at full load	0.90
	Efficiency at half load	0.88

The cost of energy is Rs. 7.5/kWh. Which motor to be selected based on yearly saving in consumption? if the cost of Standard Motor is 200000/- and cost of energy efficient motor is 270000/- then in your opinion which motor to be selected for the installation?

b) List the types of power distribution system. Illustrate anyone in detail **(10)**

Q. 5 a) An office room measuring (43m (L) × 18m (B) × 5m (H) requires an average illumination of 400 lux. **(15)**

a. State the design consideration for above lighting system
b. Calculate the number of luminaires (fixtures) required
c. Draw the lighting layout
d. Calculate the Lighting Power Density (LPD)

b) Define energy monitoring and Targeting. **(05)**

Q 6 Write a short note on **(any four)** **(20)**

i) Preliminary Energy Audit
ii) Single line diagram
iii) CUSUM technique
iv) Building Management System (BMS)
v) Variable Speed Drives as an Energy Efficient Measure

TURN OVER

52D665BA610210D6637CEC2F494602A3

Data for Illumination Design problems

K	R_C = 0.7			R_C = 0.5			R_C = 0.3		
	R_{FC} = 0.5	R_W = 0.3	R_W = 0.1	R_{FC} = 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

TURN OVER

52D665BA610210D6637CEC2F494602A1

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 1st 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
	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	28	9.2	36	11	32	9.2	-	-	-	- CABLES
6	40	7.1	36	6.4	48	7.1	40	6.4	-	-	-	- ONLY
10	53	4.4	49	3.8	64	4.4	54	3.8	-	-	-	-
16	70	2.7	62	2.3	85	2.7	71	2.3	-	-	-	-
25	79	1.8	70	1.6	106	1.8	90	1.6	114	1.8	95	1.6
35	98	1.3	86	1.1	128	1.3	115	1.1	139	1.3	122	1.1
50	-	-	-	-	163	0.92	140	0.81	178	0.92	148	0.81
70	-	-	-	-	207	0.65 0.54	179	0.57	218	0.65 0.54	186	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	346	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

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 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
	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	28	18	24	15	-	-	-	-
4	37	12	31	9.6	-	-	-	-
6	48	7.4	41	6.3	50	7.0	42	6.3
10	66	4.3	55	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	145	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	0.83 0.64	180	0.57	220	0.65 0.54	190	0.57
95	257	0.48 0.48	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	393	0.25 0.23	330	0.24	410	0.29 0.23	350	0.24
240	461	0.23 0.18	389	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

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

[TURN OVER

52D665BA610210D6637CEC2F494602A3

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.				
	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	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	80	4.5	4.5	52	3.9	72	4.5	4.5	65	3.9	-	-	-	-	-	-
25	78	2.9	2.9	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	133	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	179	0.90
95	175	0.93	0.75	150	0.80	223	0.77	0.75	197	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	0.48	200	0.64	296	0.51	0.48	259	0.48	320	0.55	0.48	0.51	270	0.45
185	-	-	-	-	-	345	0.42	0.39	200	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	0.22	418	0.30	516	0.36	0.23	0.39	435	0.25
380	-	-	-	-	-	554	0.26	0.19	465	0.28	584	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	648	0.18

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 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	82	4.5	53	3.9	85	4.5	55	3.9
25	82	2.9	70	2.5	88	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	150	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	0.46
185	-	-	247	0.37	-	-	260	0.37
240	-	-	296	0.29	-	-	313	0.29
300	-	-	340	0.25	-	-	358	0.25

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

52D665BA610210D6637CEC2F494602A3

BE – Sem-VIII – CBSGS – Electrical

Paper / Subject Code: 52802 / Drives & Control

14/5/19

Time: 3 hours **Marks: 80**

Instructions:

- Question No: 1 is compulsory.
- Answer any three from the remaining five questions.
- Figures to the right indicate full marks.
- Answers to questions should be grouped and written together.

Q1	a)	State the main factors which decide the choice of electrical drive	20
	b)	Illustrate dynamic braking and plugging in a DC series motor	
	c)	Prove that the energy loss during stopping by plugging is $\frac{3}{2}J\omega_{ms}^2$	
	d)	How to select a motor for continuous duty?	
Q2	a)	Explain in details the components of load torque.	10
	b)	A weight of 500 kg is being lifted up at a uniform speed of 1.5 m/s by a winch driven by a motor running at a speed of 1000 rpm. The moment of inertia of motor and winch are 0.5 and 0.3 kg-m^2 respectively. Calculate the motor torque and equivalent moment of inertia referred to the motor shaft. In the absence of weight, motor develops a torque of 100 N-m when running at 1000 rpm.	10
Q3	a)	Explain the operation of closed loop speed control scheme with inner current control loop. What are the various functions of inner current control loop	10
	b)	What do you understand by steady state stability? What is the main assumption? Derive the inequality constraints for steady state stability condition.	10
Q4	a)	Define intermittent periodic duty and short time duty. Derive over loading factor in both cases.	10
	b)	How a chopper fed DC separately excited DC motor operate in motoring and regenerative braking mode. Develop ω *vs* T relation and draw speed torque characteristics	10
Q5	a)	Describe the operation dynamic braking of an induction motor	06
	b)	Illustrate with neat circuit diagram the static rotor resistance control. Also show that the effective rotor resistance increased by $0.5R(1-\delta)$	08
	c)	What are the reasons for using load equalization in an electrical drive?	06
Q6	a)	Describe the operation of stepper motor along with its driver circuit	10
	b)	What is the basic principle of Direct torque control method? Explain with block diagram.	06
	c)	Derive fundamental torque equation and mention the significance of dynamic torque	04

*****

BE - sem-VIII - CBSGS - Electrical

Paper / Subject Code: 52810 / Power System Planning & Reliability

24/5/19

(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) State the objectives of transmission system planning.
   b) Draw bath tub curve and define all three regions in it.
   c) Show that M.T.T.F. is reciprocal of failure rate λ
   d) What is operating reserve. Define Outage Replacement Rate (O.R.R.)

2. a) Describe the various data requirements for composite system reliability evaluation. 10
   b) Explain frequency and duration method and hence explain the concept of rate of departure. 10

3. a) Differentiate in Short term, Medium term and Long term planning. 10
   b) Explain two state Markov model and derive the expression of availability and unavailability. Draw the state space model for three units indicating all transition rates. 10

4. a) A generating system consists of the following units: 10
   1*10MW units with FOR of 0.08
   1*20MW units with FOR of 0.08
   1*30MW units with FOR of 0.08
   1*40MW units with FOR of 0.08
   Calculate LOLE for this system for a single daily peak load of 60MW.
   b) A generating system contains 3*25MW units each with a 4% FOR and 1*30MW unit with a 5% FOR. If the peak load for a 100 day period is 75MW, what is the LOEE for this period? Assume that the appropriate load characteristic is a straight line from the 100% to the 80% points. 10

5. a) Explain PJM method in detail 10
   b) What is reactive power planning? What are the methods used for reactive power planning? 10

6. a) Explain in details various factors affecting generation planning ? 10
   b) What is Load forecasting ? Describe different techniques used for load forecasting. 10

BE-Sem-VIII - CBSGS - Electrical

20/5/11

Paper / Subject Code: 52803 / Elective II- 1) Flexible AC Transmission System

(3 Hours) **[Total Marks - 80]**

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

Q1. Answer **all** questions

	a.	State five comparisons between SVC and STATCOM	05
	b.	Write a short note on ideal load compensator?	05
	c.	What are the objectives of series compensation?	05
	d.	Explain in brief the basic types of FACTS controllers?	05
Q2	a.	Show that voltage sensitivity for load reactive power is $\frac{dv}{dq} = \frac{-E/SSC}{1+kr^{\wedge}(E/SSC)}$	10
	b.	Explain the shunt compensation by synchronous voltage source with the help of necessary diagram	10
Q3	a.	Explain in detail the methods of improving power factor in single phase AC system	10
	b.	Explain variable impedance type series compensation (TSSC).	10
Q4	a.	Explain the Fixed Capacitor Thyristor controlled Reactor (FC-TCR) in detail along with operating VI characteristics	10
	b.	Explain the Thyristor Controlled Phase Angle Regulator (TCPAR).	10
Q5	a.	Explain power flow through mesh transmission line with suitable example in details	10
	b.	Explain switching converter type series compensation (SSSC)	10
Q6	a.	Explain the operating principle of Unified Power Flow Controller (UPFC) with relevant diagrams	10
	b.	Explain the Thyristor Controlled Reactor (TCR) in detail & state the condition to obtain Thyristor Switched Reactor (TSR) from it	10