**AIKTC/KRRC/SoET/ACKN/QUES/2017-18/** **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<br>Flexible AC transmission System | EEE80X | | ✓ | 02 |
| 5 | | | | | |
| 6 | | | | | |
| | | | | | |
| | | | | | |

**Note: SC – Softcopy, HC - Hardcopy**

(Shaheen Ansari)
**Librarian, AIKTC**

B.E-sem-VIII- CBGS - Electrical

**Paper / Subject Code: 52801 / Design , Management & Auditing of Electrical Systems**

20/11/18

**(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) Soft starter provide significant energy savings in case of variable torque load **(02)**
2) In a distribution system air circuit is generally used as main circuit breaker **(02)**
3) Electronic ballast will improve energy efficiency **(02)**
4) Energy efficient motor is more compact in size compared to standard motor of same rating **(02)**
5) Derating factors does not play vital role in cable sizing and selection **(02)**
6) In a distribution network, Dyn11 grouped transformer is generally used **(02)**

Q 1 b. Name and explain the function of following protective devices **(05)**

i) No.51 ii) No.52 iii) No.27 iv) No.32 v) No.55

Q 1 c. What can you say about energy monitoring and Targeting. List out the elements of monitoring and targeting **(05)**

Q 2 a) From the data given below, **(10)**

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

| Type of load | Load in kW | Efficiency | Power Factor | Load Factor | Diversity Factor |
|---|---|---|---|---|---|
| Plant I | 800 | 0.9 | 0.8 | 0.8 | 0.7 |
| Plant II | 600 | 0.8 | 0.85 | 0.75 | 0.8 |
| Heaters | 350 | 0.8 | 0.7 | 0.85 | 0.85 |
| Other load | 300 | 0.75 | 0.75 | 0.9 | 0.8 |

b) Discuss various energy efficient technologies used to improve performance of motor. **(10)**

Q 3 a) A MCC supplies power to 5 motors each of 15HP, 50Hz, 440V, 0.85p.f lag operating at 87%, 1440rpm, delta connected I.M. Distance between MCC and motor installation is 40m. Ambient temp is 40°C. Fault level at distribution point is 20kA. Assume type F installation. Size the copper cable for supplying power from MCC to motor and specify the same. Make suitable assumptions if necessary with justifications. **(10)**

| Sr. No | Type of Cable | Value of k (Cu) |
|---|---|---|
| a) | PVC cable $\leq 300mm^2$ | 115 |
| b) | PVC cable $> 300mm^2$ | 103 |
| c) | XLPE cable | 114 |

b) What are the factors are to be considered while selection and installation of DG set? Explain in detail. **(10)**

Q 4 a) What way you would design illumination system for a reading room with dimensions (20L*15B*3.5H) in meter. Develop the lighting layout and justify the various assumptions. **(10)**

b) How would you classify types of installation of capacitor bank in detail? **(10)**

Q 5 a) Define Energy Audit? Explain need of energy audit? Explain in detail the steps taken to perform detailed audit **(10)**

b) How would you categorize different means to achieve the energy efficiency in motor? Explain in detail. **(10)**

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

- **i)** Variable Speed Drives
- **ii)** UPS
- **iii)** CUSUM Technique
- **iv)** Energy Management System
- **v)** Elementary Diagram

**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 |
| | | | |

TURN OVER .....

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 | - | - | - | - |
| 4 | 32 | 11 | 29 | 9.2 | 36 | 11 | 32 | 9.2 | - | - | - | - |
| 6 | 40 | 7.1 | 36 | 6.2 | 46 | 7.1 | 40 | 6.2 | - | - | - | - |
| 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 | 1.8 | 106 | 1.8 | 90 | 1.8 | 114 | 1.8 | 95 | 1.8 |
| 35 | 98 | 1.3 | 86 | 1.1 | 133 | 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 | 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 | 345 | 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 |

- FLAT
- CABLES
- ONLY

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 | 9.5 | - | - | - | - |
| 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 | 1.8 |
| 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 | 451 | 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 |

## 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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(3)

B.E – sem- VIII – Electrical

28/11/18

**Paper / Subject Code: 52802 / Drives & Control**

**Time: 3 Hours** **Marks: 80**

Note:- 1. Question No. 1 is compulsory

2. Attempt any **three** questions out of remaining **five** questions

3. Figures to the right indicates marks

4. Assumptions made should be clearly stated

| | | | |
|---|---|---|---|
| Qu.1 | (a) | Draw the block diagram of Electric drive. State the function of power modulator. | [5] |
| | (b) | Explain the following terms 1) Intermittent periodic duty. (2) Continues duty with starting & breaking. | [5] |
| | (c) | Explain plugging operation in DC motor drives. | [5] |
| | (d) | Differentiate scalar control & Vector control Schemes. | [5] |
| Qu.2 | (a) | A constant speed motor has the following duty cycle.<br>(a) load rising linearly from 200 to 500 KW for 4 min.<br>(b) Uniform load of 400 KW for 2 min.<br>(c) Regenerative power returned to the supply reducing linearly from 400 KW to zero for 3 min.<br>(d) Remains ideal for 4 min.<br>Determine the power rating of the motor assuming loss to be proportional to $(\text{power})^2$ | [10] |
| | (b) | Explain V/F method of speed control of 3 phase induction motor | [05] |
| | (c) | How slip power wasted in rotor circuit resistance of IM can be recovered using static Scherbius drives. Explain? | [05] |
| Qu.3 | (a) | Explain AC dynamic braking of an induction motor with two lead connections. | [10] |
| | (b) | Explain the operation of chopper control separately excited dc motor in motoring & regenerative braking mode. | [10] |
| Qu.4 | (a) | Explain the multi-quadrant operation of a motor driving a hoist load with suitable diagram. | [10] |
| | (b) | Discuss the operation of single phase fully controlled converter fed dc motor separately excited motor in continues mode along with its speed torque characteristics of drive | [10] |
| Qu.5 | (a) | Explain with neat block diagram direct vector control scheme of induction motor. | [10] |
| | (b) | Explain the closed loop speed control scheme with inner current control loop | [05] |
| | (c) | Derive the temperature expression for the thermal model of motor for heating & draw its characteristics with time. | [05] |
| Qu.6 | (a) | Draw the circuit diagram of switched reluctance motor & explain its working. | [10] |
| | (b) | Write a short note on stepper motor drive. | [10] |

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(3) BE-sem-VIII – CBSGS – Electrical

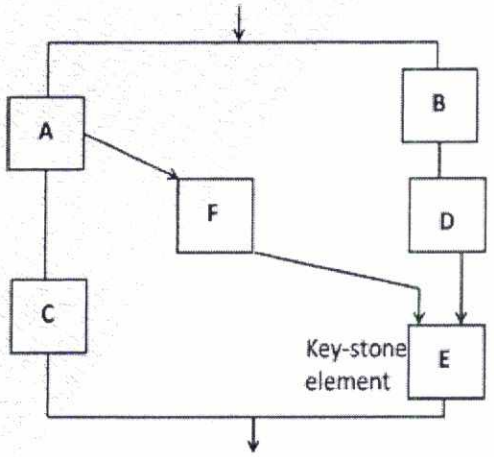
**Paper / Subject Code: 52810 / Power System Planning & Reliability**

11/12/1

**(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.

| | | |
|---|---|---|
| | | **20** |
| Q 1. | Answer any four of the following questions. | |
| a) | What do you mean by weather load model? | **5** |
| b) | Write short note on DC load flow. | **5** |
| c) | What do you mean by bath tub curve in reliability studies? | **5** |
| d) | Obtain COPT of a generating system consisting of:<br>3*10MW units with FOR of 0.01<br>1*20MW unit with FOR of 0.01 | **5** |
| e) | Draw the Markov model used for rapid start units in operating reserve studies. | **5** |
| Q 2 a) | Explain various classifications of power system loads. | **10** |
| Q 2 b) | What do you mean by load forecasting? | **10** |
| Q 3 a) | Explain reactive power planning of power system. | **10** |
| Q 3 b) | Explain strategic planning of powers system. | **10** |
| Q 4 a) | Derive the general expression for reliability in terms of hazard rate. | **10** |
| Q 4 b) | Evaluate reliability of the given system using conditional probability method. Each component has a reliability of 0.99. Take E as the key-stone element. | **10** |



Q 5 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.

Q 5 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**

Q 6 a) What are the various data required for reliability evaluation of composite generation and transmission systems? **10**

Q 6 b) Write short notes on: **10**

i) Area risk curve ii) Outage replacement rate

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(4)

B.E-sem-VIII - CBSGS - Electrical

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

4/12/18

**Duration 3 Hours** **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 **all** questions

| | | | |
|---|---|---|---|
| | a) | Explain the merits and demerits of transmission interconnection? | 05 |
| | b) | Write a short note on ideal load compensator? | 05 |
| | c) | What are the objectives of shunt compensation? | 05 |
| | d) | Explain the factors limit the loading capability of transmission line? | 05 |
| Q2 | a) | Explain in detail with necessary diagrams the basic types of FACTS controller? | 10 |
| | b) | Explain the Thyristor Controlled Reactor (TCR) in detail & condition to obtained Thyristor Switched Reactor (TSR) from TCR. | 10 |
| Q3 | a) | Derive approximate formula for voltage regulation using short circuit level. | 10 |
| | b) | Explain variable impedance type series compensation (TSSC). | 10 |
| Q4 | a) | Explain power factor correction in a single phase system | 10 |
| | b) | Explain the Thyristor Controlled Phase Angle Regulator (TCPAR). | 10 |
| Q5 | a) | Explain switching converter type series compensation (SSSC). | 10 |
| | b) | Explain the midpoint shunt reactor or capacitor var compensator in detail with the help of two machine system. | 10 |
| Q6 | a) | Explain the shunt compensation by synchronous voltage source | 10 |
| | b) | Explain the basic operating principle of Unified Power Flow Controller (UPFC) with relevant diagram. | 10 |