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

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

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	Power System Operation and Control	EEC701		✓	02
2	High Voltage DC Transmission	EEC702		✓	02
3	Electrical Machine Design	EEC703		✓	02
4	Control System – II	EEC704		✓	02
5	Elective	EEE70X			
6					

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

(5) BE-sem-VII - CBSGS - Electrical 7/5/19

Paper / Subject Code: 42201 / Power System Operation & Control

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

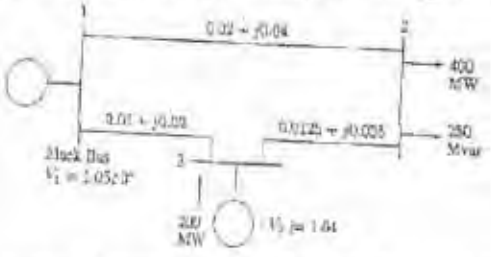
Note : 1. **Q. 1 is compulsory.**
2. Solve any **3** questions out of remaining questions.
3. Assume suitable data if necessary.

Q.1 a) Explain the concept of equal area criterion for stability studies. (20)
b) What is the necessity of load frequency control?
c) What are assumptions made in Fast decoupled load flow studies?
d) What is the significance of penalty factor in optimal operation?

Q.2a) A 50 Hz, 4 pole, turbo generator, rated 100MVA, 11kV has an inertia constant of 8MJ/MVA.
i) Find the stored Kinetic Energy in the rotor at synchronous speed.
ii) If the mechanical input is suddenly raised to 80MW for an electrical load of 50 MW find the rotor acceleration, neglecting mechanical and electrical losses.
iii) What will be change in the rotor torque angle and rotor speed in rpm at the end of acceleration period of part ii) maintained for 10 cycles. (10)

Q.2b) Consider a power system where a single machine tied to an infinite bus through two parallel lines. Derive the critical clearing angle for stability if a sudden short circuit occurs at the midpoint of one of the parallel lines. The maximum power transmitted under pre fault, during fault and post fault is P_{max1}, P_{max1i}, P_{max1ii}. (10)

Q.3a) For the 3 bus power system shown in the figure below with the generation at buses 1 & 3. The voltage at bus 1 is $1.05\angle 0$ pu. V_3 is 1.04 pu with real power generation of 200 MW. A load consisting of 400 MW and 250 MVar is taken from bus 3. Line impedances are marked in pu on 100MVA base. Obtain $|V_2|^{(1)}$ and $|V_3|^{(1)}$ using accelerated GS algorithm (α=1.6).



(10)

Q.3 b) Discuss various types of busses in load flow studies and their significance (10)

Q.4a) A system consists of two plants connected by a tie line and a load is located at plant 2. When 125 MW are transmitted from plant 1, a loss of 15 MW takes place on the tie line. Determine the generation schedule at both the plants and power received by the load when λ for the system is Rs. 25per MWhr and the incremental fuel costs (IC) are given by the equations below:

$IC_1 = 0.025P_1 + 15$ Rs / MWhr

$IC_2 = 0.05P_2 + 20$ Rs / MWhr (10)

Q.4b) Derive the expression for the exact co-ordination equation for economic dispatch. (10)

Q.5a) Show that if the speed changer setting is changed by ΔP_c and the load demand changes by ΔP_D, the steady frequency change is given by $\Delta f = \{ 1 / (B+1/R) \} (\Delta P_C - \Delta P_D)$ (10)

Q.5b) Explain the P-V Curve and Q-V curve for voltage stability. (10)

Q. 6 Write short notes on (any two) (20)

a. Types of transactions and interchanges of energy
b. Optimal Unit commitment and reliability considerations.
c. ALFC with integral control action

BE - Sem - VII - CBSGS - Electrical 13/5/19

(3 Hours) [Total Marks: 80]

N.B. :
(1) Question No.1 is compulsory
(2) Attempt any three from the remaining
(3) Figures to the right indicate full marks
(4) Assume suitable data if necessary

1	Solve any four :-		20
	(a)	What are the main components of HVDC transmission?	
	(b)	What is current margin?	
	(c)	State the consequences of harmonics in HVDCT.	
	(d)	Explain the necessity of DC regulator in HVDC system.	
	(e)	Draw the equivalent circuit of HVDCT line.	
2	(a)	Explain commutation failure with diagram and waveform	10
	(b)	Draw and explain the operation of a 6 pulse converter with overlap angle less than 60°	10
3	(a)	Explain ground return in HVDC.	10
	(b)	Explain different types of faults in HVDC link.	10
4	(a)	Explain over voltage and over currents protection in HVDC	10
	(b)	Explain basic control characteristics of HVDC	10
5	(a)	Explain two methods of Individual Phase control	10
	(b)	Compare AC transmission and HVDC transmission	10
6	(a)	Explain the filters in HVDCT.	10
	(b)	Give the equivalent circuit of a 12 pulse converter. What are the different condition modes?	10

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(4)

B.E - Sem - VII - CBSGS - Electrical

Paper / Subject Code: 42203 / Electrical Machine Design

12/5/19

Duration:- Three Hours **Total Marks : 80**

NOTE

1. Question No 1 is Compulsory.
2. Solve any three out of the remaining.
3. Figure to the right side indicates marks.
4. Assume the suitable data and mention the same if required

Q1. Answer the following questions.

a. Explain different types of magnetic materials. [5]

b Discuss the choice of flux density for designing of transformer. [5]

c. Explain in brief the methods of cooling of a transformer. [5]

d. Discuss various insulating properties of transformer oil. [5]

Q2. a. Derive an output equation of single phase & three phase transformer. [10]

b. Determine the main dimensions and number of turns of a 100 KVA, 6600/ 440V, delta star connection, 50 Hz, 3 phase core types transformer with data, three step core arrangement, Emf per turn = 10 V maximum flux density: 1.3 wb /m2, current density : 2.5 A/mm2, window space factor = 0.3, stacking factor:0.9 over all height = overall width.. [10]

Q3. a.. Discuss designing of cooling tanks & tubes in a transformer. [10]

b. A 100KVA, 2000/400V, 50Hz, 1ph, Shell type transformer, has sandwich coils. There are two full hv coils, one full lv coil and 2 half lv coils. Calculate the value of leakage reactance referred to hv side. The data given is: depth of hv coil= 40mm, depth of lv coils= 36mm, depth of duct between hv and lv=16mm, width of winding= 0.12m, length of mean turn= 1.5m, the no of turns in hv winding are 200. [10]

Q.4.a. Discuss the various mechanical forces developed in transformer with sketches. Explain how they are taken care while fabrication. [10]

b. Derive the equation for leakage reactance calculation for a two winding core type transformer [10]

Q.5.a. Derive the output equation of a three phase Induction Motor in terms of main dimensions. [10]

b. Determine the main dimensions, total conductors and number of slot, area of a slot, conductor per slot for minimum cost design, for a 3.7 KW, 400v, 1410 rpm, 3 phase, 4 pole, 50Hz, delta connected, squirrel cage induction motor with the data average flux density in air gap = 0.45 Wb/m2, ampere conductor: 23, 000 A/ m, efficiency : 0.85, power factor : 0.84, winding factor 0.955, current density : 3.5 A/ mm^2, stacking factor = 0.9, slot space factor= 0.4. [10]

Q.6 a. Discuss various steps to be followed while designing a rotor of induction motor for main dimensions. [10]

b. Discuss the design modifications in a stator & rotor of an energy efficient motor. [10]

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(8) BE-sem-VII-CBSGS-Electrical 23/5/19

Paper / Subject Code: 42204 / Control System -II

(3 Hours) **[Total Marks – 80]**

NB

1. Question No.1 is compulsory.
2. Attempt any three questions from remaining.
3. Use semi log paper where necessary.
4. Assume suitable data wherever necessary.

Q.1 Attempt any four questions.

a. Compare lead and lag compensator on the basis of pole zero plot and Electrical circuit? [5]

b. What do you mean by "Tustin Transformation" why it is used? [5]

c. Explain issues in implementation of industrial PID controller. [5]

d. Explain start and stop interlocking circuit in PLC programming with the help of example. [5]

e. Explain Phase variable, CCF and OCF with example? [5]

f. How many words are occupied by counter instruction in the counter file? [5]

Q.2

a. Design a lag compensator for a unity feedback system for transfer function given by $G(s) = \frac{K}{s(s+1)(0.5s+1)}$ to meet following requirement:

GM = 10db, $\emptyset_m = 40°$, $K_v = 5$/sec [15]

b. Explain Proportional band in case of PID controller. [5]

Q. 3

a. Design a state feedback controller to yield a 20.8% overshoot and settling time of 4 second for a plant $\dot{X} = Ax + Bu$ And $Y = Cx$

Where $A = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ -1 & -5 & -6 \end{bmatrix}$ $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ $C = [10 \quad 1 \quad 0]$ & $D = [0]$

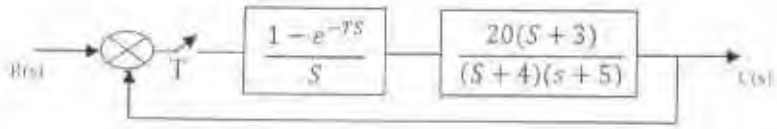
[10]

b. Prove that the transform of sampled output is the product of the transform of the sampled input and pulse transfer function of the system and thus derive transfer function of the system. [10]

Q.4

a. Explain the relationship between numbers assigned to data files in memory and numbers used by input and output modules in PLC with example. [10]

b. For step and ramp input find the steady state error for unity feedback system shown in figure with sampling time interval "T=0.1 seconds " . [10]



Q.5

a. Find G(Z) . for $G_1(S) = \frac{(S+2)}{S(S+1)}$ in cascade with zero order sample and hold . The sampling period is T=0.5 sec. [10]

b. What is PB and integral Kick in case of PID controller? [10]

Q.6

a. Explain Memory unit of PLC. [10]

b. Explain Jump and label operations in PLC [10]