AIKTC/KRRC/SoET/ACKN/QUES/2022-23/ **Date:** 25/01/23

School: SoET-REV. C-SCHEME **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	Electrical Drives & Control	EEC701		✓	
2	Electrical Power System III	EEC702		✓	
3	Department Level Optional Course-III HVDC Transmission Systems	EEC703		✓	
4	Department Level Optional Course-IV Microgrid and Smart-grid	EEC704		✓	
5	Institute Level Optional Course-I	EEE70X			

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

~~**AIKTC/KRRC/SoET/ACKN/QUES/2022-23/**~~ ~~**Date:**~~

8/12/22

EE (R-19)

Sem- VII - C-19- Reg.

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

NB: (1) Question **No. 1** is **compulsory**
(2) **Answer** any **THREE** questions out of the remaining **FIVE** questions.
(3) Assume suitable data if **necessary** and **justify** them
(4) **Figure** to the **right** indicates **marks**

1. (a) What are the main factors which decide the choice of electrical drive for a given application? 5
   (b) State and explain with neat sketches the three main classes of motor duty cycle 5
   (c) With speed torque characteristics, explain the stator voltage control of induction motor. 5
   (d) Compare vector control and direct torque control of an induction motor 5

2. (a) Choose an application and explain with neat diagrams the multi quadrant operation of an electrical drive. Mention the speed torque conventions in all the four quadrants. 10
   (b) A drive has the following equations for motor torque (T) and load torque (T_l). $T = -1-2\omega_m$; $T_l = -3\sqrt{\omega_m}$ where ω_m is the motor speed in rad/s. Obtain the equilibrium points and determine their steady state stability. 10

3. (a) Derive the thermal model of motor for heating and cooling and draw the heating and cooling curves. 10
   (b) Half hour rating of a motor is 200 kW. Heating time constant is 80 min. The maximum efficiency occurs at 75% of full load. Determine the continuous duty rating of the motor. 10

4. (a) With a neat block diagram explain closed loop speed control with an inner current control loop in an electric drive. 10
   (b) Draw the circuit diagram of a four quadrant chopper drive for a DC separately excited motor and explain in detail its operation with necessary diagrams in forward motoring mode and regenerative braking mode. 10

5. (a) With the speed torque characteristics explain V/f control of induction motor. In the speed torque characteristics, include the region below base speed as well as above base speed. 10
   (b) A 3-phase, 440 volt, 50 hertz, 6 pole star connected induction motor has following parameters referred to stator: $R_s = 0.5\ \Omega$, $R_r' = 0.6\ \Omega$, $X_s = X_r' = 1\Omega$. Stator to rotor turns ratio is 2. If the motor is used for the regenerative braking, determine 10
   (i) Maximum overhauling torque it can hold and the range of speed in which it can operate safely.
   (ii) The speed at which it will hold a load with a load torque of 160 N-m

6. (a) Draw the block diagram and explain in brief the direct torque control of three phase induction motor. What is voltage vector switching table? 10
   (b) What do you mean by vector control or field oriented control of induction motor? Explain with necessary phasor diagram the working principle of vector control 10

Sem - VII - C-19 - Reg. EG - R - 19

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.

Q1. Answer the following **20**

a Draw input-output curve, heat rate curve and incremental fuel cost curve and explain their importance in economic load dispatch.

b Derive characteristic equation and state the condition for steady state stability in power system.

c Write the static load flow equations and explain the classification of buses in power system.

d For an isolated single area, consider the data given below.
Load decreases by 1% for a decrease in frequency by 1%. Find the gain and time constant of the power system represented by a first order transfer function.
Total Area Capacity=1000 MW, Normal Operating Load = 500 MW, H = 5 sec, R= 2.5 Hz / pu MW, Operating Frequency =50 Hz.

e Draw the diagram to indicate interconnection between different operating states of power system and explain each operating state.

Q 2. A Derive the equation for optimum generation scheduling considering transmission losses (Exact coordinate equation) **10**

Q 2. B A synchronous generator is generating 20% of the maximum power it is capable of generating. If the mechanical input to the generator is increases by 250% of the previous value, calculate the maximum value of torque angle during the swing of rotor round the new equilibrium point. **10**

Q3. A Compare GS, NR and Fast decoupled load flow methods for solution of Static Load Flow Equations of a power system. **10**

Q3. B A constant load of 300 MW is supplied by two 200 MW generators, 1 and 2, for which the respective incremental fuel costs are **10**

$IC_1 = 0.1P_1 + 20$ Rs/MWh

$IC_2 = 0.12P_2 + 15$ Rs/MWh

with powers in MW and costs C in Rs/hr. Determine (a) the most economical division of load between the generators, and (b) the saving in Rs/day thereby obtained compared to equal load sharing between machines.

Q4. A Derive Swing equation for a synchronous machine that describes rotor dynamics. **10**

Q 4. B Find the steady state power limit of a system consisting of a generator equivalent reactance 0.50 pu connected to an infinite bus through a series reactance of 1.0 pu. The terminal voltage of the generator is held at 1.20 pu and the voltage of the infinite bus is 1.0 pu. **10**

Q 5 A Draw complete block diagram and explain dynamic response of Load frequency controller for an isolated power system with and without PI controller. **10**

Q 5.B For the following system generators are connected to all the four buses and loads are connected at buses 2 and 3. All buses other than slack bus are PQ buses. Assuming flat voltage start, determine the bus voltages at the end of first Gauss Seidel iteration. **10**

Line Bus to bus	Y(pu)
1-2	2-j6
1-3	1-j3
2-3	0.6667-j2
2-4	1-j3
3-4	2-j6

Bus	P(pu)	Q(pu)	V(pu)	Remarks
1	-	-	$1.04\angle 0^{\circ}$	Slack
2	0.5	-0.2	-	PQ
3	-0.1	0.5	-	PQ
4	0.3	-0.1	-	PQ

Q 6. A What is power pool? Explain the different types of energy transactions and interchanges in power system. **10**

Q 6. B Two generators rated 250 MW and 350 MW are operating in parallel. The droop characteristics of their governors are 4% and 5%, respectively from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would a load of 600 MW be shared between them? What will be the system frequency at this load? Assume free governor operation. **10**

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14/12/22

EE (R-19)

Time: 3 Hours Sem - VII - C+ - Reg. Marks: 80

Note :

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

			Marks
Q. 1		Solve **ANY FOUR** questions from following. (Each question carries 5 marks)	20
	a)	Compare HVAC and HVDC Transmission w.r.to Technical parameters of system.	
	b)	Illustrate the need and operation of VDCOL, voltage dependent current order limit in HVDC control	
	c)	Illustrate with neat diagram the features of HVDC link which has both positive and negative polarity conductors	
	d)	Operation of the bridge converter with overlap angle between 60° and 120° is abnormal. Justify	
	e)	Explain the additional control characteristics in HVDC inverter side used under abnormal operation.	
Q. 2	a)	Illustrate with neat diagram the Component of HVDC Converter Station.	10
	c)	Derive the expression for direct current of a three phase rectifier with grid control and overlap angle less than 60 degree	10
Q.3	a)	Demonstrate the IPC scheme used in HVDC and mention its advantages and disadvantages	10
	b)	Illustrate the control characteristics of HVDC system	10
Q.4	a)	What are the different protection methods used in HVDC system. Exemplify with neat diagrams.	10
	b)	Illustrate with neat waveform the effect of single commutation failure and double commutation failure	10
Q.5	a)	Illustrate with neat diagram and waveforms the operation of a twelve pulse converter	10
	b)	What is the need of seventh valve in HVDC system and explain with circuit diagram and waveform the operation of seventh valve in rectifier operation	10
Q.6	a)	Illustrate in detail the effect of harmonics and the various means of reducing it.?	10
	b)	Develop the equivalent circuit of the inverter side of an HVDC system	10

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Paper / Subject Code: 42277 / Microgrid and Smart-grid (DLOC - IV)

16/12/22

EE (R-19)

Sem - VII C-19 - Reg.

Duration: 3hrs **MGSG** **[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**	**[20]**
	a	Define micro grid and state it's advantages.	
	b	Compare centralized and de-centralized control of micro grid.	
	c	Draw and elaborate a suitable diagram of AMI in smart grid	
	d	Define smart grid and elaborate it's need in current situation.	
	e	Compare characteristics of Solar PV and Wind energy source as a renewable energy sources	
2	a	Compare non-conventional sources with respect to their suitability and characteristics in micro grid.	**[10]**
	b	'Energy storage devices play a very important role in micro grid.' Justify the statement.	**[10]**
3	a	Draw schematic diagram of D.C. microgrid and elaborate it along with its advantages, disadvantages, and limitations.	**[10]**
	b	Give importance of islanding in case of grid connected micro grid. Also give the proper sequence of operation for successful islanding.	**[10]**
4	a	Draw a block diagram on hierarchical control and elaborate its working	**[10]**
	b	What is black start? Does micro grid is helpful for it? Justify your answer.	**[10]**
5	a	State inverter control modes and elaborate any one in detail.	**[10]**
	b	Draw and elaborate a functional block diagram of smart meter	**[10]**
6	a	Enlist various communication methods used for smart grid and elaborate any one in detail.	**[10]**
	b	Describe the 'self-healing' characteristic of smart grid	**[10]**

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