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Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 8013

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023
Second Semester
Power Systems Engineering
P19PS205 – HIGH VOLTAGE DC TRANSMISSION SYSTEMS
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Depict the bipolar link for HVDC transmission with a neat diagram.	2	K1	CO1
2.	What are the applications of HVDC transmission?	2	K2	CO1
3.	In a 'p' pulse converter, if there are 'q' valves in a basic commutation group and r of these are connected in parallel and 's' of them are connected in series, Derive the expression of valve utilization factor.	2	K2	CO2
4.	In a 'p' pulse converter, if there are 'q' valves in a basic commutation group and r of these are connected in parallel and 's' of them are connected in series, Derive the expression of transformer utilization factor.	2	K2	CO2
5.	Why the feedback control of power in a DC link is not desirable?	2	K4	CO3
6.	Compare the advantages of Pulse phase control over pulse frequency control.	2	K2	CO3
7.	Draw the circuit of high pass C-Type filter.	2	K1	CO4
8.	Draw the circuit of second order high pass filter.	2	K1	CO4
9.	What are the advantages of Parity simulator for HVDC System simulation?	2	K2	CO5
10.	Write the target objectives of HVDC system simulation.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)		Compare HVAC and HVDC transmission system on the basis of economics, technical performance and reliability	13	K5	CO1
			(OR)			
	b)	i.	Briefly describe different components of a HVDC system.	8	K2	CO1
		ii.	How the choice of voltage level can be made in HVDC system for bulk power transmission?	5		
12.	a)		Sketch the waveforms of the output voltage and the transformer secondary current in the case of 3-phase, 6-pulse bridge circuit (Graetz's circuit).	13	K1	CO2
			(OR)			
	b)		Explain twelve pulse converter with its operating principle, advantages, disadvantages and applications in detail.	13	K2	CO2
13.	a)		What are different schemes of Individual phase control (IPC)?Discuss its disadvantages.	13	K2	CO3
			(OR)			
	b)		What are different schemes of Equidistant pulse control (EPC)? Discuss its disadvantages.	13	K2	CO3
14.	a)		Discuss the effect of pulse number and overlap angle on harmonics generated by HVDC converters.	13	K4	CO4
			(OR)			
	b)	i.	What are the adverse effects of Harmonics produced by the HVDC converters?	7	K4	CO4
		ii.	How firing angle error affects the harmonic content?	6		
15.	a)	i.	What are the requirements of a good simulation tool for HVDC?	5	K3	CO5
		ii.	Describe a HVDC Simulator. What are problems that can be studied using it?	8		
			(OR)			
	b)	i.	Describe different component models associated with Digital dynamic simulation of HVDC systems.	8	K3	CO5
		ii.	Mention the advantages and disadvantages of Digital Dynamic Simulation?	5		

PART – C

(1 x 15 = 15Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	Derive the expression of steady state DC current in a two terminal DC link.	7	K5	CO3
		ii.	Draw the Converter controller characteristics of HVDC System under normal mode of operation.	8		
			(OR)			
	b)		What are the various sources of harmonics generation in a HVDC line? Describe how a double tuned filter can be designed for a HVDC system.	15	K3	CO3

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Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 8015

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023
Second Semester
Power Systems Engineering
P19PS206– RESTRUCTURED POWER SYSTEMS
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What do you mean by restructured power market?	2	K1	CO1
2.	Identify the components of ISO in power markets.	2	K3	CO1
3.	Define Total Transmission Capability (TTC).	2	K1	CO2
4.	Write the significance of transmission expansion.	2	K1	CO2
5.	Infer the concept of generation rescheduling.	2	K2	CO3
6.	Identify the methods to relieve congestion in transmission lines.	2	K3	CO3
7.	List the various transmission pricing methods.	2	K1	CO4
8.	Infer the merits and demerits of MW-mile pricing method.	2	K2	CO4
9.	What is opportunity cost?	2	K1	CO5
10.	Define Tariff and availability based tariff.	2	K1	CO5

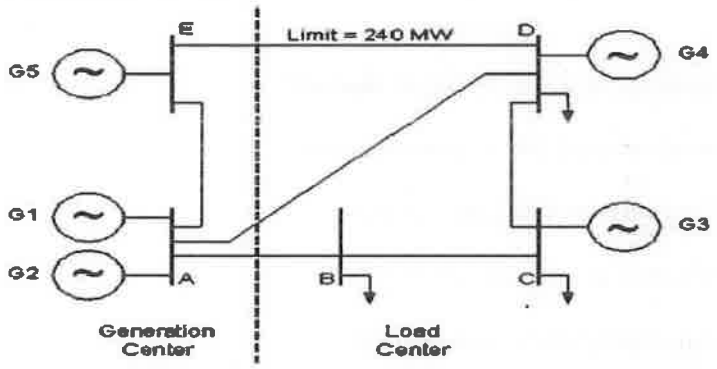
PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Explain any two models of power system restructuring with their main characteristics and necessary functions.	13	K2	CO1

(OR)

b)	i.	Infer the role of ISO in power market.	8	K2	CO1
	ii.	Explain the implementation of restructured power market in UK.	5		
12. a)	i.	Identify the functions of transmission planning.	7	K3	CO2
	ii.	Interpret the constraints to be considered in computing ATC.	6	K2	
		(OR)			
b)		Analyze any two computational procedures to calculate TTC.	13	K4	CO2
13. a)	i.	Compare inter zonal and intra zonal congestion management.	7	K4	CO3
	ii.	Explain about FTR in congestion management.	6	K2	
		(OR)			
b)		The line data of a five bus system is shown in figure. The marginal cost of all generators are given table. The loads are inelastic and are 300 MW each. Find LMP for all generators using DCOPF method. Assume 4th bus is as reference. The generators (1-5) marginal cost is as follows (Dollar/Mw): 14,15,30,35 and 10.	13	K3	CO3



Line Data	A-B	A-D	A-E	B-C	C-D	D-E
R (%)	0.281	0.304	0.064	0.108	0.297	0.297
X (%)	2.81	3.04	0.64	1.08	2.97	2.97
Limit (MW)	999	999	999	999	999	240

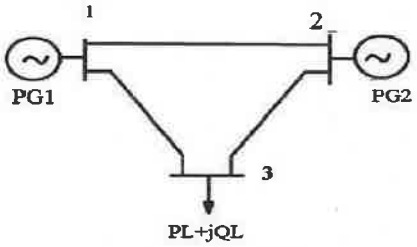
Line data of 5 bus system

14. a)	i.	Infer the issues related to transmission pricing in the electricity trading over transmission network.	8	K2	CO4
	ii.	Explain the characteristics of transmission pricing.	5		
		(OR)			
b)		Interpret MVA-mile method of transmission pricing with an example.	13	K2	CO4
15. a)	i.	Explain the importance and salient features of Indian Electricity Act 2003.	8	K2	CO5
	ii.	Differentiate any two regulatory framework policies in India.	5	K4	
		(OR)			
b)		Analyze the important issues, benefits and improvements in implementing the unscheduled interchange in India.	13	K4	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16. a)	i.	Analyze the factors behind economic efficiency and how does it relate to SRMC? Infer the concept of SRMC and explain how the SRMC will be determined.	9	K4	CO4
	ii.	Demonstrate the procedure for power flow tracing method for a three bus system with two generators and three transmission lines.	6	K2	
		(OR)			
b)	i.	Find ATC for all lines using PTDF method.	8	K4	CO2



Bus No	Generation	Load (MW)
1	200	0
2	700	100
3	0	800

From Bus	To Bus	Line Reactance (pu)	Max. Power capacity (MW)
1	2	0.1	600
2	3	0.033	200
3	3	0.1	600

	ii.	Explain about ancillary services in restructured power system.	7	K2	CO2

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Question Paper Code: 8021

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023
Second Semester
Power Systems Engineering
P19PS207 – POWER SYSTEM AUTOMATION
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What are the principles to be observed in installing a safe emergency stop system with a PLC?	2	K1	CO1
2.	Which arrangement of inputs is described by the Boolean relationshipA. $\overline{B}$?	2	K2	CO1
3.	Highlight the significance of multi-port communication in power system automation.	2	K1	CO2
4.	Identify the role of pulse inputs and outputs.	2	K2	CO2
5.	Identify the four basic parts of a SCADA system.	2	K2	CO3
6.	Highlight the advantages of implementing SCADA systems for electrical distribution.	2	K1	CO3
7.	What are the principles of substation Human Machine Interface (HMI)?	2	K3	CO4
8.	Which trend reports are generally monitored in automated electrical substation?	2	K3	CO4
9.	What is the role of Master Terminal Units (MTUs)?	2	K1	CO5
10.	Identify the characteristics of distribution automation.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Which form of logic gate system is given by a ladder diagram with a rung having two normally closed gates in parallel?	4	K4	CO1
		ii.	Devise ladder programs for systems that will carry out the following tasks: (a) Switch on an output 5 s after receiving an input and keep it on for the duration of that input. (b) Switch on an output for the duration of the input and then keep it on for a further 5 s. (c) Switch on an output for 5 s after the start of an input signal.	9		
			(OR)			
	b)	i.	Explain the continuous updating and the mass input/output copying methods of processing inputs/outputs.	6	K4	CO1
		ii.	Devise ladder programs for systems that will carry out the following tasks: (a) Give an output after a photocell sensor has given 10 pulse input signals as a result of detecting 10 objects passing in front of it. (b) Give an output when the number of people in a store reaches 100, there continually being people entering & leaving the store.	7		
12.	a)		In detail explain the components of Remote Terminal Unit (RTU) with neat block diagram/architecture to accomplish the tasks of monitoring and controlling the field devices.	13	K2	CO2
			(OR)			
	b)	i.	What are Intelligent Electronics Devices (IEDs)?	3	K2	CO2
		ii.	Describe and illustrate the functional blocks of IED.	10		
13.	a)	i.	Explain how a SCADA system works.	8	K2	CO3
		ii.	Illustrate the SCADA system hierarchy from field level devices to mainframe data processing computer.	5		
			(OR)			
	b)	i.	Explain the role of telemetry in SCADA systems.	5	K3	CO3
		ii.	Frame the suitable communication network for SCADA system with computers and servers.	8		
14.	a)		Explore and describe with neat block diagram the bay level functions of automated substation.	13	K2	CO4
			(OR)			
	b)		In detail explain the fault detection, isolation and restoration processes in automated electrical substation.	13	K2	CO4

15.	a)	Frame the SCADA based feeder control system for electrical distribution automation.	13	K3	CO5
		(OR)			
	b)	Explain the importance of distribution automation. Discuss about DAS hardware and software and explain how it is used in fault isolation.	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Construct the 21st century substation for monitoring and protection of power grid by utilizing advanced metering infrastructure. Highlight the benefits achieved through modern automated electrical distribution substation.	15	K5	CO2
		(OR)			
	b)	Develop an appropriate SCADA based substation control system using telemetry and computer infrastructure.	15	K5	CO3

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Question Paper Code: 8024

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023
Second Semester
Power Systems Engineering
P19PSE13 – POWER ELECTRONICS FOR RENEWABLE ENERGY
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Give any two environmental aspects of electric energy conversion.	2	K2	CO1
2.	List the factors influencing the amount of GHG emissions.	2	K2	CO1
3.	Show the merits of squirrel cage induction generators for wind energy conversion.	2	K2	CO2
4.	Why are induction generators preferred over dc generators in WECS? Justify.	2	K3	CO2
5.	Summarize the role of capacitor and the minimum value required for the boost converter.	2	K3	CO3
6.	Generalize the significance of buck boost converter.	2	K2	CO3
7.	What is fault ride through capability?	2	K2	CO4
8.	Define energy payback period.	2	K1	CO4
9.	Point out the merits of wind-diesel hybrid system.	2	K2	CO5
10.	Label the schematic diagram of PV-Diesel hybrid system.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Discuss the impact of renewable energy generation on environment.	13	K2	CO1
		(OR)			
	b)	What is Hydrogen energy? Explain the operation of hydrogen energy system with schematic diagram.	3+10	K2	CO1
12.	a)	Draw the equivalent circuit and show the steady state analysis of Permanent magnet Synchronous Generator (PMSG).	13	K1	CO2
		(OR)			
	b)	Explain machine capacity factor and capacity utilization factor. Explain the principle of operation of double output induction generator system with neat diagram.	5+8	K2	CO2
13.	a)	Draw the schematic diagram of Buck-Boost converter and explain the operation in detail.	13	K1	CO3
		(OR)			
	b)	State the principle of operation of PWM inverter and describe how it is used for wind energy conversion.	13	K2	CO3
14.	a)	Show the various grid connected issues and its impact on system stability.	13	K3	CO4
		(OR)			
	b)	Discuss the impact of high penetration of wind power into power grid.	13	K3	CO4
15.	a)	Discuss and classify the working of MPPT in a solar PV system.	13	K3	CO5
		(OR)			
	b)	With a neat sketch, describe the operation of PV-Diesel hybrid system.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Compare the power extraction aspects of solar PV system with wind energy system.	15	K4	CO5
		(OR)			
	b)	Discuss in detail the grid system characteristics and explain with a neat diagram the standalone and grid integrated solar system	15	K4	CO4

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Question Paper Code: 8028

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023

Second Semester

Power Systems Engineering

P19PSE23 – POWER ELECTRONICS APPLICATIONS TO POWER SYSTEMS

(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What are reasons for poor performance of solar cells?	2	K2	CO1
2.	List the parameters to be considered for selection of inverters in Grid Connected PV System.	2	K3	CO1
3.	Differentiate between the direct radiation, diffusion radiation, and global radiation.	2	K2	CO2
4.	Draw the structure of Matrix converters. List the advantages.	2	K1	CO2
5.	Draw the structural diagram depicting the challenges in grid integration. List some important factors among them.	2	K1	CO3
6.	What is Weak AC Grid? Write two factors that mostly affect its Performance.	2	K2	CO3
7.	What are the effects of flickers and how do we mitigate it?	2	K2	CO4
8.	What are the various problems associated with integration of PV system into the grid?	2	K2	CO4
9.	Differentiate between TCR, TSR and Segmented TCR	2	K1	CO5
10.	In which conditions are STATCOM preferred over SVC? Compare STATCOM and SVC.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Draw the various conventional 6×6 PV array topologies. Also, write the mathematical expressions to each of the configuration. Write the limitations of conventional PV array configurations.	7	K3	CO1
		ii.	Design a PV array configuration which is generating the maximum current of 30 A at maximum power of 6.5 KW. Use the following PV module specifications.	6	K4	

Peak Power, P_{max}	180 W
Peak Power Voltage V_{mp}	36 V
Peak Power Current, I_{mp}	5 A
Open Circuit Voltage, V_{OC}	45 V
Short Circuit Current, I_{SC}	5.55 A
Number of series connected cells in a module, n_s	72

(OR)

	b)	i.	What is the significance of DC-DC Converters in Standalone and Grid connected PV System? Classify and explain any two converters with necessary diagrams and equations.	6	K2	CO1
		ii.	A buck chopper circuit is supplied with power from an ideal battery of terminal voltage 100 V. The load voltage waveform consists of rectangular pulses of duration 1 ms in an overall cycle time of 2.5 ms. Calculate the average and RMS values of the supply voltage. Also, calculate the RMS value of its fundamental component and the ripple factor.	7	K4	
12.	a)		What is the significance of Three phase AC voltage controllers in WECS? Explain 3-ph AC voltage controller with neat schematic diagrams and derive necessary equations.	13	K2	CO2

(OR)

	b)		What is the significance of PWM Inverters and Multi level Inverters? Explain any two Inverters with neat schematic diagrams and derive necessary equations.	13	K2	CO2
13.	a)	i.	With neat schematic diagrams explain about Standalone operation of fixed and variable speed wind energy conversion systems and solar system	8	K2	CO3
		ii.	What is extra-terrestrial and terrestrial solar radiation? How is the value of solar constant obtained? Does the extra-terrestrial solar radiation vary with time?	5	K3	

(OR)

	b)		What is the significance of grid integrated PMSG based WECS solar system. Explain with necessary diagrams and derive necessary equations.	13	K2	CO3
14.	a)	i.	What is power quality? Briefly discuss about main causes of poor power quality.	7	K2	CO4
		ii.	Briefly discuss about solutions for mitigation of power quality issues.	6	K3	
			(OR)			
	b)	i.	With neat schematic diagrams explain the fault behavior of wind and solar systems	8	K2	CO4
		ii.	List the International standards for grid integration of renewable energy sources.	5	K3	
15.	a)	i.	Draw and explain the Voltage Vs Power characteristics of a shunt compensated and uncompensated transmission lines at different power factors (Lagging, UPF, Leading)	7	K3	CO5
		ii.	With the help of necessary diagrams and waveforms, explain how the power system oscillations can be damped when the phase angle regulators were included in the transmission line.	6	K3	
			(OR)			
	b)	i.	With the help of power angle diagrams, explain the characteristics of transient stability during Pre-fault, fault, post fault conditions for series compensated and uncompensated transmission lines.	7	K2	CO5
		ii.	Derive the expression for real power of a series compensated network in terms of "K". Draw the power angle diagram for different values of "K".	6	K3	

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Person X owns a kindle and a laptop. He wants to charge both the devices (Note: The devices are of different rating) using the same converter circuit. The laptop has rating of 16.8 W, 21V while the kindle rating is 10W, 10V. Presently he wants to charge laptop using a source of 14V/2A. Design a converter and help him to charge his laptop. The allowable voltage deviation is 5% while the current deviation is 2%. Help the designer to design the required converter. Make the necessary assumptions if any.	15	K4	CO2

(OR)

b)	As a Government of India initiative for promoting use of renewable energy in Electric vehicles, Tamil Nādu Transport Ministry issues an open competition for developing a charging solution using Solar PV's. Assuming you are a power electronic engineer, design the appropriate solution for this problem. Make the necessary assumptions wherever required with justification. The developed solution should comply the following constraints: • The maximum power that can be extracted from the PV panels is 100W. • The panels generate the power with varying voltage levels of 20-30V. • The EV to be charged is assumed to have a battery of 12V, 8Ah rating. • The sampling time of the designed solution should not exceed 100 μs.	15	K4	CO3

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Question Paper Code: 2007

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE 2023
First Semester
Power Systems Engineering
P19MA103 – OPTIMIZATIONS TECHNIQUES
(Regulation 2019)

Time : Three Hours | Maximum : 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	If X and Y are independent random variables with variance 2 and 3. Find the variance of $3X + 4Y$.	2	K3	CO1
2.	Define Normal Distributions.	2	K3	CO1
3.	Find the value of k, if $f(x,y) = k(1-x)(1-y)$ in $0 < x < 1,\ 0 < y < 1$ is to be the joint density function.	2	K3	CO2
4.	Two regression lines are $5x - y = 22, 64x - 45y = 24$. Find the means of X and Y.	2	K3	CO2
5.	Define Type I and Type II errors in taking a decision.	2	K1	CO3
6.	Define Chi-Square test for goodness of fit.	2	K2	CO3
7.	Write the standard form of LPP.	2	K1	CO4
8.	How does the problem of degeneracy arise in a Transportation problem?	2	K2	CO4
9.	Explain forward and backward recursion.	2	K1	CO5
10.	Describe the general characteristic of Dynamic Programming.	2	K2	CO5

PART – B

(5 x 16 = 80 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	A random variables X has the following probability function: a. Find K b. If $P[X \leq C] > 1/2$ Find the minimum value of C c. Evaluate $P[1.5 < X < 4.5 / X > 2]$	8	K3	CO1
		ii.	Find the MGF corresponding to the distribution $f(x) = \begin{cases} \frac{1}{2}e^{\frac{-x}{2}}, x > 0 \\ 0, \ otherwise \end{cases}$ and hence find its mean and variance of x	8	K3	CO1
			(OR)			
	b)	i.	It is known that the probability of an item produced by a certain machine will be defective is 0.05.If the produced item was sent to the market in packets of 20, find the number of packets containing at least, exactly and at most 2 defective items in a consignment of 1000 packets by using Poisson approximation.	8	K3	CO1
		ii.	The time in hours required to repair a machine is exponentially distributed with parameter $\lambda = 1/2$ a. What is the probability that the repair time exceeds 2 hours? b. What is the conditional probability that a repair takes atleast 10hours given that its duration exceeds 9 hours?	8	K3	CO1
12.	a)	i.	The joint probability mass function of (X, Y) is given by $P(x, y) = k(2x + 3y),\ x = \{0, 1, 2\};\ y = \{1, 2, 3\}$. Find K and all the marginal and conditional probability distributions.	8	K3	CO2
		ii.	The joint probability density function of the random variable (X, Y) is given by $f(x, y) = K\,xye^{-(x+y)}, x \geq 0$. Find the value of K. Are X and Y independent?	8	K3	CO2
			(OR)			
	b)	i.	Find the coefficient of correlation for the following heights (in inches) of father (X) and their sons (Y) X: 6566 6767 6869 7072 Y: 6768 6568 7272 6971	8	K3	CO2
		ii.	The two lines of regression are $8X - 10Y + 66 = 0$, $40X - 18Y - 214 = 0$. The variance of X is 9. Find the mean values of X and Y. Also find the coefficient of correlation between the variables X and Y.	8	K3	CO2

X	0	1	2	3	4	5	6	7
$P(X)$	0	K	$2K$	$2K$	$3K$	K^2	$2K^2$	$7K^2 + K$

13. a) i. A sample of 900 members has a mean 3.4 cm and standard deviation 2.61 cm. Is the sample from a large population of mean 3.25 cms and standard deviation of 2.61 cms? (Test at 5% level of significance. The value of z at 5% level is $|Z_{\alpha}| < 1.96$). 8 K3 CO3

ii. Test if the difference in the means is significant for the following data: 8 K3 CO3

Sample I	76	68	70	43	94	68	33	
Sample II	40	48	92	85	70	76	68	22

(OR)

b) An automobile company gives you the following information about age Groups and the liking for particular model of car which it plans to introduce. On the basis of this data can it be concluded that the model appeal is independent of the age group.($\chi^2_{0.05}(3) = 7.815$) 16 K3 CO3

Person who:	Below 20	20-39	40-59	60 and above
Liked the car:	140	80	40	20
Disliked the car:	60	50	30	80

14. a) Solve the following : 16 K3 CO4

$$\text{Max } Z = 15x_1 + 6x_2 + 9x_3 + 2x_4$$
$$\text{Subject to } 2x_1 + x_2 + 5x_3 + 6x_4 \leq 20$$
$$3x_1 + x_2 + 3x_3 + 25x_4 \leq 24$$
$$7x_1 + x_4 \leq 70$$
$$\text{and } x_1, x_2, x_3, x_4 \geq 0$$

(OR)

b) i. Solve the following transportation problem using Vogel's approximation method. [M/J 2013] 8 K3 CO4

		Destination				
		A	B	C	D	Supply
	I	6	1	9	3	70
Source	II	11	5	2	8	55
	III	10	12	4	7	70
Demand		85	35	50	45	

ii. Solve the following assignment problem: 8 K3 CO4

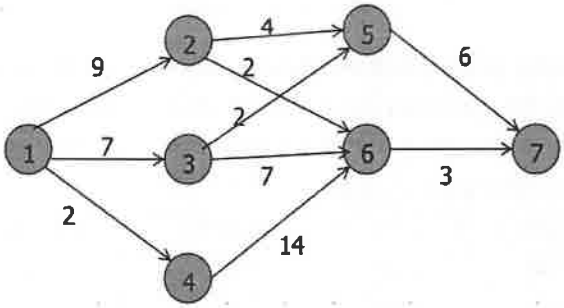
	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

15. a) Solve the LPP by DPP Max $Z= 3x_1+4x_2$ Subject to $2x_1+5x_2 \leq 120$, $4x_1+2x_2 \leq 80$, $x_1, x_2 \geq 0$. 16 K5 CO5

(OR)

b) i. Write the algorithm of dynamic programming. 8 K5 CO5

ii. A salesman located in a city 1 decided to travel to city 7.He knew the distances of alternative routes from city 1 to city 7.he then drew a highway network map as shown in figure. The origin is city 1. The destination city 7 and so is others. Find shortest path. 8 K5 CO5



June 2023

I st Sem to 7 th Sem.

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]

Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

XQB-227

Question Paper Code: 8018

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS –JUNE 2023

First Semester

Power Systems Engineering

P19PS101– POWER SYSTEM OPERATION AND CONTROL

(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A (10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Compare series and shunt capacitors.	2	K2	CO1
2.	Where are synchronous condensers installed?	2	K1	CO1
3.	What are the difficulties to find unit commitment solution?	2	K1	CO2
4.	List the assumption involved in dynamic programming method.	2	K1	CO2
5.	How is incremental operating cost related to economic dispatch?	2	K1	CO3
6.	Illustrate incremental fuel cost curve for a thermal plant.	2	K3	CO3
7.	What are the tasks of energy control centre?	2	K1	CO4
8.	What are the hierarchical levels used in EMS.	2	K1	CO4
9.	What is the objective of Maximum likelihood criterion?	2	K1	CO5
10.	Compare load flow study and state estimation.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Explain in details about voltage control method in transmission system.	13	K2	CO1
		(OR)			
	b)	Classify the reactive power compensation devices for reactive power control.	13	K2	CO1

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (AUTONOMOUS) Page No XQB-227

12.	a)	Explain with neat flow chart the procedure for finding the solution for unit commitment problems using Lagrangian relaxation method.	13	K2	CO2
		(OR)			
	b)	i. Illustrate the flow chart of dynamic programming method in Unit commitment.	8	K2	CO2
		ii. Summarize the advantages and assumptions in dynamic programming method.	5	K2	
13.	a)	A plant has two generators supplying the plant bus and neither is to operate below 20MW or above 135MW. Incremental costs with P_{G1} and P_{G2} in MW are $\frac{dF_1}{dP_{G1}} = 0.14 P_{G1} + 21$ Rs / MWhr $\frac{dF_2}{dP_{G2}} = 0.225 P_{G2} + 16.5$ Rs / MWhr for economic dispatch, determine the plant λ when the demand equals (a) 45 MW ; (b) 125 MW ; (c) 250 MW.	13	K5	CO3
		(OR)			
	b)	Examine the computer approach solution by λ – iteration method without losses in economic dispatch scheduling.	13	K4	CO3
14.	a)	Explain the hardware components and functional aspects of SCADA system using a fundamental block diagram.	13	K2	CO4
		(OR)			
	b)	List the functions in Energy Control Centre and explain its operation.	13	K2	CO4
15.	a)	Illustrate a state transition diagram of a power system showing different sets of operating states classified according to security level. Mark on the diagram and explain the state transitions that may occur due to system disturbances and also the different control actions that can be taken to improve the security level of the system.	13	K2	CO5
		(OR)			
	b)	Explain in detail about weighted least square estimate in state estimation.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	There are 3 thermal generating units which can be committed to take the system load of 800 MW. The fuel cost data and generation operating limit data are given below. Obtain an optimum unit commitment using brute force enumeration technique. $F_1 = 0.006\ P^2_{G1} + 7\ P_{G1} + 600$ $F_2 = 0.01\ P^2_{G2} + 8\ P_{G2} + 400$ $F_3 = 0.008\ P^2_{G3} + 6\ P_{G3} + 500$ Operating limits are $100 \leq P_{G1} \leq 400$ MW $50 \leq P_{G2} \leq 300$ MW $150 \leq P_{G3} \leq 500$ MW Power demand = 800MW	15	K5	CO2
		(OR)			
	b)	Determine Priority list using full load average production cost for the data given.	15	K5	CO2

Unit no	Loading limits		Fuel cost parameters			Fuel cost
	Min	max	a_i	b_i	C_i	
1	100	400	0.006	7	600	1.1
2	50	300	0.01	8	400	1.2
3	150	500	0.008	6	500	1.0