Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058.

End Semester Exam, DEC2023

Max. Marks:100 **Duration: 3hrs**

MTech Programme SEM-1	Construction Management	Structural Engineering	Power Electronics and Power Systems
Course Code of Research Methodology	PC-MTCM103	PC-MTSE103	PC-MTPX103

Instructions:

1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary
5. Use of Standard Tables permitted

Question No		Max Marks	CO	Module
Q1A	What are the research avenues in your branch of engineering? What may be research approach and methodology to deal with those? Draw research methodology flowchart to showcase. Explain how to conduct the literature survey in carrying out research? What is the difference between Invention, Discovery and Research?	10	CO1	M1
Q1B	Explain the Mechanics of Writing a Research Report with appropriate examples. What are the contents of research report? What precautions are to be taken while writing the research report? What ethical practices are expected to be adopted? State different research approaches utilized in industries and Conceptualize the research process.	10	CO1	M2
Q2A	The following are the number of departmental stores in 15 cities: 35, 17, 10, 32, 70, 28, 26, 19, 26, 66, 37, 44, 33, 29 and 28. If we want to select a sample of 25 stores, using cities as clusters and selecting within clusters proportional to size, how many stores from each city should be chosen?(Use a starting point of 5).	10	CO2 CO3	M4
Q2B	A population is divided into three strata so that N1 = 6000, N2 = 3000 and N3 = 4000. Respective standard deviations are: s1=13, s2=15 and s3=9. How should a sample of size n = 82 be allocated to the three strata, if we want optimum allocation using disproportionate sampling design? If the cost for strata is 2500, 1500, 1800 what can be cost disproportionate sampling design?	10	CO2 CO3	M4
Q3A	Researcher conducted experimental investigations on concrete cubes, to study the influence of fly ash, GGBS and glass waste powder (GWP) individually, on the compressive strength of concrete. The cubes were casted for M30 grade of concrete and by random sampling method, tested after 28 days curing. For cubes in Group I, 30% fly ash was added, for Group II, 30% GGBS was added and in Group III, 30% GWP was added. The 28 days compressive strengths of cubes in N/mm^2 are given below. Check whether the mean compressive strength of the 3 different groups is same or not. Group I – 31, 32, 31, 35, 29, 27 Group II – 36, 29, 33, 29, 34 Group III – 33, 34, 29, 32, 33, 36, 26	10	CO2 CO3	M5
Q3B	We want to test on the basis of sample size 35 determinations and at 0.05 level of significance whether the thermal conductivity of a certain kind of plate is 0.34 units, as has been claimed. The mean of sample is 0.343. From the information gathered in similar studies, we can expect that the variability of such determinations is given by $\sigma = 0.01$.	10	CO2 CO3	M4 M5

Q4A	What do you mean by stratification? Why it is to be done? Explain How do you carry out stratification using computer? Refer the given data, Identify the vital factor to control defects.	10	CO1 CO2	M3 M5 M7

Staff	No.of Defects	Shift	Machine	Temp.
A	46	I	102	High
B	22	II	103	Low
C	5	III	104	High
D	9	I	102	Medium
E	10	II	103	Low
F	26	III	104	High
G	188	I	102	Medium
H	130	II	103	Low
I	7	III	104	High
E	12	I	102	High
F	2	II	103	Low
G	2	III	104	High
A	22	I	102	High
F	12	II	103	Low
D	10	III	104	High
A	11	I	101	Low

Q4B	A data of 350 Life Cycle Test machines was collected and analysed to know association between type of machines and acceptability of Guage R and R . The response by Type of machine are as follows. At alpha =0.05 do these data suggest an association between Type of machine and acceptability of Guage R and R?	10	CO2 CO3	M1 M3

	Automatic machines	SemiAutomatic machines	Total
Acceptable Guage R&R	19	31	50
Not Acceptable Guage R&R	171	131	302
Total	190	162	352

Q5A	What do you mean by Causal Relationship? Explain the usage of the tools with appropriate examples for depicting causal relationships. What do you mean by regression analysis? Explain coefficient of correlation, scatter diagram, R^2, R^2 adj.	10	CO2 CO3	M1 M5
Q5B	Write short note on the following terms. I. Normal Distribution II. Type I error III. Type II error IV. Confidence Interval V. Level of Significance VI. Test Statistic VII. T distribution VIII. F distribution IX. Census X. Sampling	10	CO2 CO3	M4 M5
Q6A	A flow chart describing copyright registration process in India.	10	CO2 CO3	M5
Q6B	Differentiate among Patent Trademark and Copyright.	10	CO2 CO3	M6 M7
Q7A	Prepare the process flow chart for obtaining patent in India	10	CO2 CO3	M6 M7
Q7B	Prepare a note on Trademark based on following points 1.Meaning 2.Examples 3.Period 4.Specific rules in India 5.Procedure to get the trademark registered and approved.	10	CO2 CO3	M6 M7

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26/12/23

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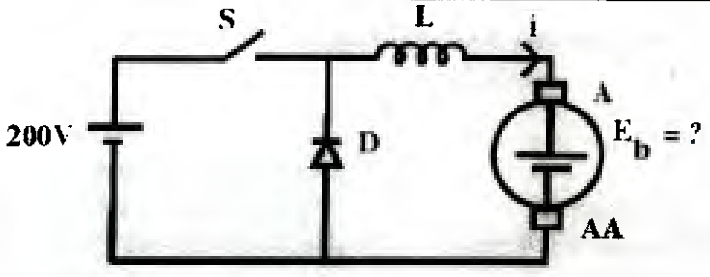
End Semester Examination
Dec-2023

Max. Marks: 100 Duration: **03 Hours**
Class: **M.TECH.** Semester: **I** Program: **M.TECH (PEPS)** Sem I
Name of the Course: **Advanced Power Electronics** Course Code: **PC-MTPX-101**

Instructions:

- All Questions are compulsory
- Answers to all sub questions should be grouped together
- Figures to the right indicates full mark
- Assume suitable data if required and justify the same.

Ques. No	Description of question	Max. Marks	CO
Q. 1a	What is the goal of power electronics? Discuss the reasons for the advancement of power electronics?	07	01
Q. 1b	What are the characteristics of practical switch used in power electronics converter? How it differs from ideal switch.	05	01
Q. 1c	Discuss the process and thermal design aspect in power electronics converters.	08	02
Q. 2a	What is resonant Converter? Derive the characteristics equations for undamped series resonant circuit.	10	02
Q. 2b	Discuss the operation of ZCS resonant-switch DC-DC buck converter in different modes.	10	02
Q. 3a.	Explain the losses in switches during hard-switching and explain the use of snubber circuit. Compare the SOA of switch for soft switching and hard switching.	10	02

Q. 3b.	Derive the performance equations of practical boost converter circuit in continuous conduction mode.	**10**	**02**
Q. 4a.	What is isolation in converter? Explain the operation of flyback converter.	**12**	**02**
Q. 4b.	 The parameters of the circuit are: Ra= 0, total inductance = 50 mH, switching frequency = 500 Hz. Duty cycle is 0.5, Av. current drawn by the motor is = 10A. Assume load current is continuous. Determine Imax and Imin.	**08**	**02**
Q. 5a.	Explain the state space averaging technique in control of switch mode DC supply.	**10**	**02**
Q. 5b.	What is current mode control? Discuss advantages of current mode control over direct duty ratio control.	**10**	**02**
Q. 6a.	What are the issues of 2-level inverter as the power level increases? How these issues are addressed?	**05**	**01**
Q. 6b.	Draw the waveforms and discuss the operation of 12-pulse uncontrolled AC-DC converter.	**10**	**02**
Q. 6c.	What are the various control techniques of voltage source converter?	**05**	**01**
Q. 7a.	Draw the circuit configuration for 4-Quadrant operation of induction motor drive using inverter.	**05**	**02**
Q. 7b.	Explain the control of Front-end converter and Back-converter in 4-Quadrant operation of back to back VSI.	**10**	**02**
Q. 7c.	In rectifier control, as the number of pulses in the output voltage increases, filtering requirement decreases. Justify.	**05**	**01**

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END SEMESTER EXAMINATION JAN. 2024

Program: F.Y. M.Tech. PEPS Sem I **Duration: Three Hour**

Course Code: PCMTPX102 **Maximum Points: 100**

Course Name: Computer Aided Power System Analysis **Semester: I**

Notes:
1 Question No. 1 is compulsory.
2. Solve any four questions from remaining six.
3. Draw neat diagrams wherever necessary.
4. Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL	Module No.
1.	**Answer any four.** **a.** Explain nonlinear constraint optimization problem along with concept of Lagrangian multiplier. **b.** Explain the load flow problem in power system. **c.** Discuss the stability problem in large multi machine power system. **d.** Explain long term forecasting for system planning. **e.** Write short notes on State Estimation. **f.** Explain contingency analysis briefly.	05 05 05 05 05 05 05	2,3,4 2,4 3 3 3 3 4	2 2 2 2 1 2	1 2 4 5 6 7
2.	**a.** Write *Algorithm* **OR** *Flow Chart* for Solution of Static Load Flow Equation using Gauss-Seidel Method. **b.** For the tree and cotree of the oriented connected graph shown in fig. 1 ; **1.** Find Bus Incidence Matrix **2.** Branch Path Incidence Matrix **3.** Basic Cut Set Incidence Matrix **4.**Augmented Cut set Incidence Matrix **5.** Augmented Loop Incidence Matrix.	10 10	2,4 2	3 3	2 2
3.	Derive formulas to calculate the elements of Z_{BUS} matrix by using algorithm for formation of bus impedance matrix.	20	1,2	4	3
4.	**a.** Derive Static Load Flow Equations. **b.** Represent the three phase power system for short circuit studies and represent it also with a fault at bus. (Do not attempt to derive the equations. Just define the variables used for representation)	08 6 + 6	2,4 1,2	4 3	2 3
5.	**a.** Define Load Forecasting and classify the load forecasting techniques used in power system. **b.** Derive formulas for estimation of average and trend term.	10 10	3,4 2,3,4	1 4	4 5

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END SEMESTER EXAMINATION JAN. 2024

5.	**a.** Derive equation for estimating states using least square estimation technique. b. Discuss the problem of static state estimation of power system.	10 10	2,3 2,3	4 2	5 5
7.	**a.** Discuss Linear Programming briefly. **b.** Discuss Symmetrical and Unsymmetrical Faults. **c.** Derive equations for solution of first order nonlinear differential equation using Euler's Method. **d.** Write the formulas for solution of simultaneous differential equations of the following form. $\frac{dy}{dx} = f(x,y,z)$ $\frac{dz}{dx} = g(x,y,z)$	05 05 05 05	2 1,4 2,4 2,4	2 2 4 1	1 3 4 4

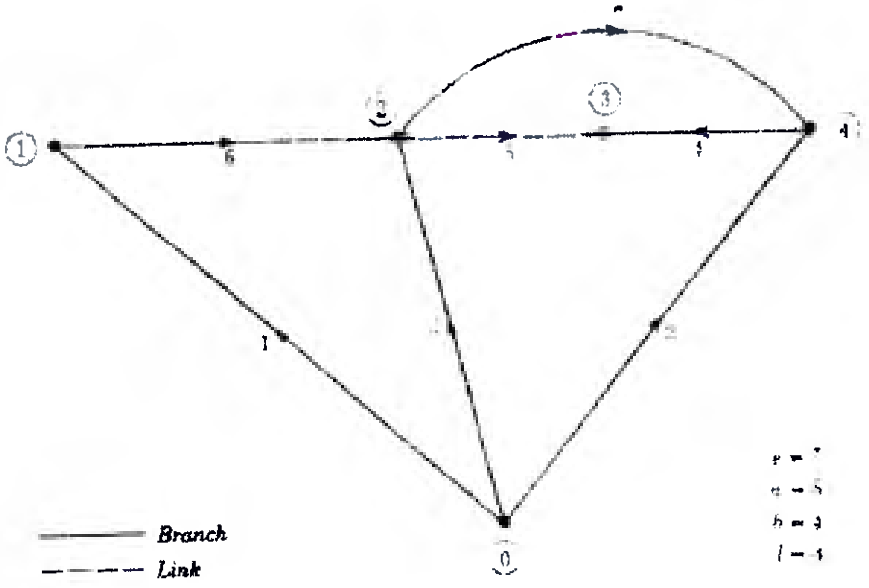

FIG. 1

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END SEM EXAMINATION DECEMBER 2023

Program: M. Tech (PEPS) Sem I **Duration: 3 hr.**

Course Code: PE-MTPX104 **Maximum Points: 100**

Course Name: Reliability Assessment of Power System **Semester: I**

Notes:

1. Attempt **any five** questions **out of seven**.
2. Draw neat diagrams wherever necessary.

Q.No.	Questions	Points	CO	BL	Module No.
Q. 1 (a)	Define the terms related to reliability assessment of power system in brief: Availability, Unavailability, Outage rate, Failure Rate, MTTF, MTBF, MTTR	14	01	BL 1,2	01
Q. 1 (b)	Discuss hazard rate function and reliability function from reliability assessment point of view in detail.	06	01	BL 1,2	01
Q. 2 (a)	Explain two generating state model from reliability assessment of power system point of view. Also explain the Markov Process and discuss its characteristics in brief.	05+05	02	BL 1, 2	02
Q. 2 (b)	Explain the Monte Carlo simulation used in reliability assessment of power system.	10	02	BL 1, 2	02
Q. 3 (a)	Discuss probabilistic generating unit model and derive long-term probability equations for two state generating model for power system reliability assessment.	05+05	02	BL 1,2	03
Q. 3 (b)	Write a short note on the probabilistic load model and hence discuss effective load in detail.	05+05	02	BL 1,2	03
Q. 4 (a)	Explain the evaluation of loss of load indices, loss of load expectation and loss of energy and give the formulae for LOLE and LOEE.	10	02	BL 1,2	04

END SEM EXAMINATION DECEMBER 2023

Q. 4 (b)	Explain the derated capacity levels in evaluation of generating capacity from reliability assessment point of view of power system. What is load forecast uncertainty in power system?	08+02	02	BL 1,2	04
Q. 5 (a)	Explain the CSP system and Grid-connected PV system and its parameters for reliability evaluation and differentiate between them based on reliability evaluation.	04+04 +02	03	BL 1,2	05
Q. 5 (b)	Explain different key aspects in wind energy system reliability evaluation, hence discuss cost estimation, economic and technical analysis of the wind energy system.	05+05	03	BL 1,2	05
Q. 6 (a)	Explain the effect of islanding in distributed generation and its implications on power system reliability.	10	03	BL 1,2	06
Q. 6 (b)	Discuss the importance of modelling and simulation in evaluating the impact of DG on the distribution system reliability.	10	03	BL 1,2	06
Q. 7 (a)	Discuss the different XML annotations for power system reliability data representation and its need from power system reliability assessment point of view.	06+04	02	BL 1,2	07
Q. 7 (b)	Explain the web service-based power system reliability data generation model with diagram used for reliability assessment of power system.	10	02	BL 1,2	07

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5/1/24

End Semester Examination

January-2024

Max. Marks: 100 Duration: **03 Hours**

Class: **M.TECH.** Semester: **I** Program: **M.TECH (PEPS)**

Name of the Course: **Electrical Vehicle System Design** Course Code: **PE-MTPX-107**

Instructions:

- Solve Any Five Questions
- Answers to all sub questions should be grouped together
- Figures to the right indicates full mark
- Assume suitable data if required and justify the same.

Q. No	Description of question	Max. Marks	CO
Q.1	**Solve Any Four**		
Q.1a	What are the features of Hybrid Electric Vehicles (HEV)?	05	04
Q.1b	What are the advantages and disadvantages of Electric Vehicles?	05	04
Q.1c	Elaborate classification of charging stations.	05	05
Q.1d	What are the features of on-board charger?	05	03
Q.1e	What is the purpose of energy management in EV/HEV?	05	03
Q.2a.	What is tractive effort in case of vehicle? Discuss the total tractive effort required to move the vehicle.	10	01
Q.2b.	Discuss the power source characteristics and torque speed characteristics of electric motor with different speed ratios.	10	01
Q.3 a)	Explain the characteristics of fast charging and associated power quality issues with the fast charging.	10	03
Q.3 b.	An electric vehicle has the following parameter values: m = 692 kg, C_D = 0.2, A_F = 2 m^2, C_0=0.009, C_1=1.75*10^{-6} s^2/m^2. Also, take density of air ρ=1.16 kg/m^3, and acceleration due to gravity g=9.81 m/s^2. The EV is stopped at a stop sign at a point in the road where the	10	01

	grade is +15%. The tractive force of the vehicle is supplied by the vehicle brakes. (i) Calculate the tractive force necessary for zero rolling resistance. (The vehicle is at rest.) (ii) Calculate the minimum tractive force required from the brakes to keep the EV from rolling down the grade.		
Q.4 a	What is the parallel HEV architecture? Discuss its operation modes and compare it with other architecture.	**12**	**02**
Q.4 b	Draw the block diagram and Explain the general EV architecture.	**08**	**03**
Q.5 a	BLDC is considered as a suitable candidate for Electric vehicle application, justify the statement.	**08**	**03**
Q.5 b	What is regenerative braking in EV? Discuss the regenerative braking of three phase induction motor with torque speed characteristics.	**12**	**05**
Q.6 a	What are the advantages of V/F control of induction motor? Discuss the V/F control of induction motor in open loop and closed loop mode.	**14**	**05**
Q.6 b	Draw the waveform of Back-Emf and ideal phase currents in the three phases of a PM brushless DC motor.	**06**	**01**
Q.7a	What are the different batteries used as energy storage? Compare these batteries based on the important parameters. Which battery is preferred for EV applications? Justify it.	**12**	**02**
Q.7b	What is Ultra capacitor? Compare it with battery. Discuss the performance of the EV when ultra-capacitor is used along with battery.	**08**	**02**