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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

29/12/23

End Semester– December 2023 Examination

Program: B.Tech Electrical Sem VII
Course Code: PC-BTE701
Course Name: Electric Drives

Duration: 3h
Semester: VII
Maximum Points: 100

- Make suitable assumptions wherever necessary.
- Club all sub question together.

Q.No	Questions	Points	CO	BL	Module
Q1. (a)	Describe the four quadrant operation of a motor driving a hoist load.	10	1	2	2
Q1.(b)	Explain the operation of a closed control scheme with inner current control loop. What are various functions of the inner current control loop?	10	1	3	4
Q2(a)	Explain with the help of a neat diagram Plugging in a 3Ø induction motor. Derive the expression for the slip.	8	3	3	6
(b)	Explain with the help of a neat diagram operation of the simultaneous dual converter controlling separately excited dc motor. What are its advantages and disadvantage over zero circulating current dual converter?	12	3	3	5
Q3(a)	A motor equipped with a flywheel is to supply a load torque of 1200 Nm for 10 sec followed by a light period of 300Nm long enough for the flywheel to regain its steady state speed. What should be the moment of inertia of flywheel? Motor has an inertia of 10 Kgm^2. It's no load speed is 600 rpm and the slip at a torque of 500 Nm is 4%. Assume speed torque characteristic of motor to be a straight line in the region of interest.	10	2	4	2
Q3(b)	What is load equalization? Derive the expression of moment of inertia of flywheel used for the load equalization.	10	1	2	2
Q4(a)	Explain with the help of the circuit diagram operation of the class E chopper in I and II quadrant. Also sketch the armature voltage and current waveform.	12	3	3	5
Q4(b)	A 200V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06Ω. It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V,50 Hz. Assuming continuous conduction, calculate: (i) Firing angle for rated torque and 750rpm. (ii) Firing angle for rated motor torque and -500rpm. (iii) Motor speed for α=160 and half the rated torque.	8	3	4	5

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End Semester– December 2023 Examination

Q5(a)	What is the slip power recovery scheme? Discuss the static Schebius drive. Derive the torque expression and draw the torque speed characteristic.	12	3	2	6
Q5(b)	A 200V, 500 rpm, 90A separately excited dc motor has the armature resistance and inductance of 0.115Ω and 11mH respectively. The motor is controlled by a chopper operating at 400 Hz. If the motor is regenerating, (i) Find the motor speed and the regenerated power at the rated current and a duty ratio of 0.5. (ii) Calculate the maximum safe speed if the minimum value of the duty ratio is 0.1.	8	3	4	5
Q6(a)	Draw and explain the block diagram of closed loop control of induction motor using V/F control.	10	3	2	6
Q6(b)	A 230 V, 100 A, 500 rpm separately excited dc motor has the armature resistance 0.1Ω. Motor is coupled with an overhauling load with a torque of 800 Nm. Determine the speed at which the motor can hold the load by regenerating braking.	10	3	4	5
Q7(a)	Draw schematic diagrams of the BLDC and PMSM; and compare these motors on the bases of the following: (i) Working principle (ii) Application	10	3	4	7
Q7(b)	Discuss the static resistance control of 3 Ø slip ring induction motor.	10	3	2	6

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Re-Exam– February 2023 Examination

Program: B.Tech Electrical Sem VII
Course Code: PC-BTE701
Course Name: Electric Drives

Duration: 3h
Semester: VII
Maximum Points: 100

- Make suitable assumptions wherever necessary.
- Club all sub question together.

Q.No	Questions	Points	CO	BL	Module
Q1.(a)	Explain how following speed transitions are carried out (i) Increase in the speed in the same direction. (ii) Decrease in the speed (iii) Speed reversal	10	1	2	4
Q1(b)	Derive the expression for the condition of steady state stability of electrical drive	10	2	2	2
Q2(a)	Describe the four quadrant operation of a motor driving a hoist load.	10	1	2	2
Q2(b)	A drive has the following parameters=10 Kgm^2, T=100-0.1S N-m. Passive load torques Tl=0.05S Nm where S is the speed in rpm. Initially the drive is operating in steady state. Now it is to be reversed. For this motor characteristic is changed to T=-100-0.1S Nm. Calculate the time of reversal.	10	1	3	2
Q3(a)	Explain with the help of a neat circuit diagram and waveforms operation of the class B chopper, driving separately excited dc motor.	12	3	2	5
Q3(b)	Explain with the help of a neat diagram dynamic braking in 3Ø induction motor. Derive the expression for the torque and slip of motor for dynamic braking.	8	3	2	6
Q4(a)	What is load equalization? Derive the expression of moment of inertia of flywheel used for the load equalization.	12	2	2	2
Q4(b)	What is the slip power recovery scheme? Discuss the static Kramer drive.	10	3	2	6
Q5(a)	A 230 V, 90 A, 500 rpm separately excited dc motor has the armature resistance and inductance of 0.115 Ω and 11mH respectively. The motor is controlled by a chopper operating at frequency 400 Hz. If the motor is regenerating, (i) Find the motor speed and the regenerated power at the rated current and a duty ratio of 0.5	10	3	3	5

	(ii) Calculate the maximum safe speed if the minimum value of the duty ratio is 0.1.				
Q5(b)	Discuss the regenerative braking operation of 3Ø induction motor. What is the direction of the magnetic field produced by the stator and rotor?	10	3	2	6
Q6(a)	Discuss the static resistance control of 3Ø slip ring induction motor.	10	3	2	6
Q7(a)	Draw schematic diagrams of the BLDC and PMSM; and compare these motors on the bases of the following: (i)Working principle (ii) Application	10	3	2	7
Q7(b)	Draw and explain the block diagram of closed loop control of induction motor using V/F control.	10	3	2	6

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END SEM RE-EXAMINATION FRBRUARY 2024

Program: Electrical Engineering Sem VII

Course Code: OE-BTE704

Course Name: Internet of Things

Duration: 3 Hr

Maximum Points: 100

Semester: VII

Notes:

- **Question 1 is compulsory.**
- **Attempt any 4 of remaining 6 questions.**
- Illustrate your answers with neat sketches wherever necessary.
- Assume appropriate data if required and state your reason.
- Preferably, write the answers in sequential order.

Q. No.	Questions	Points	CO	BL	Module No.
1.	a. Define IoT; Explain Things / Objects in IOT with example. List the applications of IoT.	5	1	2	1
	b. Explain different issues in wireless medium access.	5	2	2	1
	c. What are the common conversion methods and commonly measured quantities using sensor nodes?	5	3	2	4
	d. Write short note on: Numbers, Strings, Lists, Tuples, and Dictionaries.	5	4	2	7
2.	a. Explain various link layer protocols of IoT.	6	2	2	1
	b. Explain IoT Application and Deployment Scenarios in different domains.	6	1	2	1
	c. With the help of neat diagrams, explain the M2M system architecture.	8	1	2	2
3.	Describe Power Aware Multi-Access with Signaling, Sensor MAC, Timeout MAC, Pattern MAC.	20	2	2	3
4.	Explain Stain gauge, temperature sensor, accelerometer, light sensor, photo resister.	20	2	2	4
5	a. Describe design challenges of IoT.	8	3	2	5
	b. Describe development challenges of IoT.	8	3	2	5
	c. Describe privacy challenge of IoT.	4	3	2	5
6	a. Explain the smart home automation system in an IOT with neat system sketch?	10	4	3	6
	b. Determine the various communication models that can be used for weather monitoring system. Which is a more	10	4	3	6

END SEM RE-EXAMINATION FRBRUARY 2024

	appropriate model for this system? Describe the pros and cons.				
7.	a. Describe 5 main principles that must be taken into account by IoT developers before creating an application.	8	4	3	7
	b. Design an automatic lightening system with LDR, Light and Arduino and write a python program to support the working of that design.	8	4	6	7
	c. Write a Python program to concatenate two strings.	4	4	3	7

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END SEM EXAMINATION DECEMBER 2023

Program: Electrical Engineering B.Tech (E) Sem VII **Duration: 3 Hr**

Maximum Points: 100

Course Code: OE-BTE704

Semester: VII

Course Name: Internet of Things

Notes:

- **Question 1 is compulsory.**
- **Attempt any 4 of remaining 6 questions.**
- Illustrate your answers with neat sketches wherever necessary.
- Assume appropriate data if required and state your reason.
- Preferably, write the answers in sequential order.

Q. No.	Questions	Points	CO	BL	Module No.
1.	a. Describe the characteristic of IoT & M2M Communication with suitable explanations.	5	1	2	1,2
	b. With a neat sketch, explain the request-response communication model of IoT.	5	2	2	1
	c. Analyze the factors and characteristics to be considered while choosing a sensor for IoT applications.	5	3	4	4
	d. Explain about list and tuples in python with an example.	5	4	3	7
2.	a. Explain various link layer protocols of IoT.	6	2	2	1
	b. Explain IoT Application and Deployment Scenarios in different domains.	6	1	2	1
	c. With the help of neat diagrams, explain the M2M system architecture.	8	1	2	2
3.	a. What are the different categories of routing protocol? Explain any two example of routing protocol.	8	2	2	3
	b. Distinguish between fixed assignment and dynamic assignment in contention free medium access with example.	6	2	2	3
	c. Discuss the characteristics of MAC protocol in sensor network.	6	2	2	3
4.	a. Discuss mounting of sensor with the example of data acquisition system for any one application.	8	3	3	4
	b. Discuss the sensor types and its characteristics.	6	3	2	4
	c. Explain industrial sensors with example.	6	3	2	4
5	a. Describe design challenges of IoT.	8	3	2	5
	b. Describe development challenges of IoT.	8	3	2	5

END SEM EXAMINATION DECEMBER 2023

	c. Describe privacy challenge of IoT.	4	3	2	5
6	a. Explain the smart home automation system in an IOT with neat system sketch?	10	4	3	6
	b. Explain how IoT technology used to enable the agricultural industry to increase operational efficiency, lower costs, reduce waste, and improve the quality of their yield.	10	4	2	6
7.	a. Explain with an example difference between a python module and a package?	8	4	3	7
	b. Design an automatic lightening system with LDR, Light and Arduino and write a python program to support the working of that design.	8	4	6	7
	c. Write a Python program to concatenate two strings.	4	4	3	7

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Re-Examination February 2024

Program: BTech Electrical Engineering Sem VII **Duration: 3 hours**

Course Code: PE BTE-703 **Maximum Points: 100**

Course Name: Design, Management & Audit of Electrical Systems

Semester: VII

Notes: 1) Question is compulsory. Attempt any 4 from remaining 6.

Q. No.	Question	Points	CO	BL	Mo. No.
1	A 600 kVA, delta star 11kV/ 415V transformer with 5% impedance is suppling power to 2 three phase induction motors of 80 HP each, a 3 phase heater of 200 kW and one 3 phase induction motor of 100 HP. Draw Single line diagram showing all loads with appropriate metering, protective and switching devices. Write legend and mention ratings on SLD. Give supportive calculations. Assume suitable data for motor current calculations. (No fault calculation is required except for transformer)	20	1,2	3,5,6	1
2a	What is Energy Audit? Write down the steps of detailed energy audit.	10	1,2,3	1,2	6
2b	What are the types of tenders? What are the required elements in a tender notice?	10	3	1,3,5	4
3a	What are the typical billing components of the two part tariff structure of the industrial utility?	10	3	1,2	4
3b	Connected load of a plant is 1200 kW and Diversity factor is 0.56. What is the desirable DG set rating with respect to 0.8 PF and the set load factor of 75%?	10	2	2,3	3
4a	How does distribution losses in a plant are reduced if power factor of the plant is improved? A process plant consumes of 1000 kWh per month at 0.8 Power Factor. What is the percentage reduction in distribution losses per month if PF is improved up to 0.95 at load end?	10	1,2,3	3,4,5	2
4b	Write short note on various components and working of a DG set. What are its derating factors?	10	2	1,2	3

Re-Examination February 2024

5a	When is it suitable to use energy efficient motor? What are the design changes required to make an energy efficient motor? How are they beneficial?	10	3	3,4	5
5b	Compare On-line and Off-Line UPS with suitable block diagrams. Which is better for DATA server applications and why?	10	1,2,3	2,5	3
6a	List out different ways to reduce maximum demand of electricity in an industry?	10	1,2,3	3,4	5
6b	Identify various electrical systems and list corresponding components in a hospital.	10	1,2	1	1
7a	With the help of single line diagram, show and discuss different possible locations of capacitors in a typical power distribution system. For an induction motor which is most suitable and why?	10	1,2,3	1,2	
7b	A plant has a 2 identical 500 kVA transformers each with a no load loss of 850 W and full load copper loss of 5 kW. The plant load is 400 kVA. Compare the transformer losses when single transformer is operation and when both transformers are in parallel operation.	10	2	3,4,5	2

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END SEMESTER EXAMINATION DECEMBER 2023

Program: BTech Electrical Engineering Sem VII **Duration: 3 hours**

Course Code: PE BTE-703 **Maximum Points: 100**

Course Name: Design, Management & Audit of Electrical Systems

Semester: VII

Notes: 1) Question 1 and 2 are compulsory. Attempt any 3 from remaining 5.

2) Use given data hand book for design. In absence of any data assume suitably.

Q. No.	Question	Points	CO	BL	Mo. No.
1	A 500 kVA, delta star 11kV/ 415V transformer with 5% impedance is suppling power to 2 three phase induction motors of 80 HP each, a 3 phase heater of 150 kW and one 3 phase induction motor of 100 HP. Draw Single line diagram showing all loads with appropriate metering, protective and switching devices. Write legend and mention ratings on SLD. Give supportive calculations. Assume suitable data for motor current calculations. (No fault calculation is required except for transformer)	20	1,2	3,5,6	1
2a	For LT side of the transformer as well as for 100 HP motor, select suitable cable and cable laying method from data hand book. Assume ambient temperature to be 40^0 and length of 500 meters each for both (transformer & Motor) and 0.8 grouping factor for motor cables.	10	1,2	3,5,6	2
2	Discuss what all studies and data must be required to install roof top solar system for a residential building.	10	4	2,3	7
3a	When is it suitable to use energy efficient motor? What are the design changes required to make an energy efficient motor? How are they beneficial?	10	3	3,4	5
3b	How does distribution losses in a plant are reduced if power factor of the plant is improved? A process plant consumes of 1000 kWh per month at 0.8 Power Factor. What is the percentage reduction in distribution losses per month if PF is improved up to 0.95 at load end?	10	1,2,3	3,4,5	2
4a	Why does the maximum demand is charged by the Utility i.e., Electricity supplier? List out different ways to reduce maximum demand of electricity in an industry?	10	1,2,3	3,4	5

END SEMESTER EXAMINATION DECEMBER 2023

4b	What is Energy Audit? Write down the steps of detailed energy audit	10	1,2,3	1,2	6
5a	What are the required elements in a tender notice? Prepare a tender notice for the transformer given in question 1.	12	3	1,3,5	4
5b	A 4-pole 50 Hz squirrel case induction motor operates with 5 % slip at full load. What is the full load RPM you may expect, if frequency is changed by a V/F control to: (a)40 c/s (b) 45 c/s (c) 35 c/s	8	2,3	3,5	5
6a	A 60 kW induction motor with 85 % full load efficiency is to be replaced by a 92 % efficiency motor. What will be the savings in energy if the motor works for 6000 hours per year and cost of energy is Rs. 4.50 per kWh? Also calculate the payback period in months if the cost of energy efficient motor is Rs. 25,000/- From your result comment if energy efficient motor is beneficial in this case.	10	1,2,3	3,4,5	5
6b	Compare On-line and Off-Line UPS with suitable block diagrams. Which is better for DATA server applications and why?	10	1,2,3	2,5	3
7a	Write short note on various components and working of a DG set. What are its derating factors?	10	2	1,2	3
7b	A plant has a 2 identical 500 kVA transformers each with a no load loss of 850 W and full load copper loss of 5 kW. The plant load is 400 kVA. Compare the transformer losses when single transformer is operation and when both transformers are in parallel operation. What is your recommendation?	10	2	3,4,5	2

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END SEMESTER JANUARY 2024

Programme:B. Tech in Electrical Engineering Sem VII

Duration:3 Hr

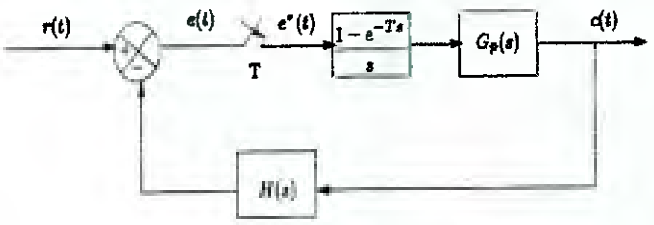
Course Code: PE-BTE704

Maximum Points:100

Course Name: Digital Control Design

Semester: VII

Note: Q1 is compulsory. Solve any four questions from the remaining six.
Assume suitable data if required and justify the assumptions.

Q.No.	Questions	Points	CO	BL	Module No.
1	a. Compare state feedback controller with output feedback controller. Why all the eigen values cannot be placed while designing output feedback control? Discuss the factors on which the number of eigen values that can be placed arbitrarily depend. b. Discuss separation principle for controller with observer. c. Compare Kalman and Gibert test to check controllability of the system d. Discuss effect of sampling and quantization on discrete representation of continuous system	20	1-4	2	1,5,6,7
2 a	Calculate the steady state errors for unit step, unit ramp and unit parabolic inputs for the unity feedback system shown below with $G_p(s) = \frac{8}{s(s+1)}$ and $T = 1\ sec$ 	05	1	3	1-2
b	Determine the pulse transfer function of unity feedback system where ZOH is in cascade with $G_p(s) = \frac{s+2}{s+1}$ and sampling time is 0.5 sec.	05	1	3	1-2

END SEMESTER JANUARY 2024

	Write merits/ limitations of the method used for s to z mapping				
c	Discuss dead beat controller design when system poles and zeros are inside the unit circle. Design the dead beat controller if plant transfer function is given by $Gp(z) = \frac{0.1152z^{-1}(1+0.9217z^{-1})}{(1-z^{-1})(1-0.7788z^{-1})}$ For the unit step input determine the number of sampling periods required for output response to reach unit step.	10	3	3	3
3a	How Lyapunov stability criterion is applied to verify stability of discrete time LTI system? Use Lyapunov approach to determine stability of the following discrete time LTI system $x[k+1] = \begin{bmatrix} 0.25 & -0.12 \\ 0.12 & 0.17 \end{bmatrix} x[k]$	07	2	3	3
b	Use Routh Hurwitz criterion to investigate the stability of the unit feedback system if loop gain is $G(z) = \frac{5(z-2)}{(z-0.1)(z-0.8)}$ Obtain the impulse response of the system and verify the answer.	07	2	3	3
c	Determine the range of K for which the closed loop unity feedback system with loop gain G(z) will be stable, where, $G(z) = \frac{k(0.0655z+0.02783)}{(z-1)(z-0.0672)}$	06	2	3	3
4a	The discrete time system is represented by $x(k+1) = Fx(k) + gu(k)$ *and* $y(k) = Cx(k)$ Where $F = \begin{bmatrix} 0 & 1 \\ -0.2 & -1 \end{bmatrix}$ $g = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $C = [1 \quad 0]$ Obtain $x(k)$ *and* $y(k)$ if input is unit step. The initial state is given by $x(0) = \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$	10	3	3	4

END SEMESTER JANUARY 2024

b	Compare regulation problem with set point tracking problem. Design set point tracker for the following system, such that, output follows step input. The desired closed loop poles are at 0.1 and 0.3. $x[k+1]=\begin{bmatrix}0 & 1\\ -0.7 & 2\end{bmatrix}x[k]+\begin{bmatrix}0\\1\end{bmatrix}u[k]$ *and* $y[k]=[0.008 \quad 0.012]x[k]$	10	3	4	4-5
5 a	Design a digital lead compensator to reduce the settling time by a factor of 2.5 where the plant transfer function of unity feedback system is given by $G_p(s)=\frac{0.2083}{s(s+1.71)}$ Also, draw a flowchart from which the compensator can be programmed.	15	3	4	7
b	When is the PID controller used? Write a procedure to design digital PID controller.	5	3	2	7
6 a	Check the observability of the following system. If the system is observable, design full order observer such that the observer poles are at 0.2 and 0.3 $x(k+1)=\begin{bmatrix}0 & 20\\ 1 & 0\end{bmatrix}x(k)+\begin{bmatrix}0\\1\end{bmatrix}u(k)$ $y(k)=[0 \quad 1]x(k)$	10	4	4	4-6
b	Compare full order observer with reduced order observer. Design reduced order observer for the system where state x1 is measurable and states x2 and x3 are to be estimated. The system matrix $F=\begin{bmatrix}0 & 0 & -4.5\\ 1 & 0 & 1.7\\ 0 & 1 & -2.3\end{bmatrix}$. Assume suitable data with justification	10	4	4	4-6
7 a	The system is described by the following difference equation $y[n]=y[n-1]+0.56y[n-2]+0.2x[n-1]+0.5x[n-2]$ Where y[n]is the output and x[n] is an input of the system	05	2	3	4

	Write state space model in the following forms (i) Controllable Canonical form (ii) Observable canonical form (iii) Jordan Canonical form				
b	Design output feedback controller for the system with two desired poles at z=0.4 and z=0.5 and state equations as x(k+1)=F x(k)+g$U(k)$ $and\ y(k) - Cx(k)$ where, $F = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -4 & 0 & 0 \end{bmatrix}$, $g = \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$	15	4	4	7

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Reexamination February 2024

Programme:B. Tech in Electrical Engineering Sem VII

Course Code: PE-BTE704

Course Name: Digital Control Design

Duration:3 Hr

Maximum Points:100

Semester: VII

Note: Solve any five questions.
Assume suitable data if required and justify the assumptions.

Q.No.	Questions	Points	CO	BL
1 a	Use Routh Hurwitz criterion to investigate the stability of the unit feedback system if loop gain is $G(z)=\frac{5(z-2)}{(z-0.1)(z-0.8)}$ Obtain the impulse response of the system and verify the answer.	10	2	3
b	Explain Jury stability test. $F(z)= z^5 + 2.6z^4 - 0.56z^3 - 2.05z^2 + 0.0775z + 0.35$ is the characteristic equation of the system. Form Jury table. Comment about stability	10	2	3
2a	Compare Impulse invariance and Bilinear transformation methods used for S to Z mapping. Determine digital controller from an analog controller by means of impulse invariance $H(s) = \frac{10}{s+2}$ Sampling time 0.01 sec	10	1	3
b	What is deadbeat controller? State the characteristics of deadbeat controller. Design dead beat controller for the plant transfer function $G_p(z) = \frac{(z+0.2)(z+5)}{z(z-1)(z-0.6)(z-0.2)}$ Validate its response for unit step input	10	03	04
3a	Define state controllability and explain Kalman test for the same. Check state controllability if	10	3	2

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	$x(k+1)=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}x(k)+\begin{bmatrix}0\\1\end{bmatrix}u(k)$			
b	Define output controllability. Check output controllability if $x(k+1)=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}x(k)+\begin{bmatrix}0\\1\end{bmatrix}u(k)$ $y(k)=\begin{bmatrix}1 & 0\end{bmatrix}x(k)$	10	3	2
4a	The state equation of the system are $x(k+1)=Fx(k)+gu(k)$ *and* $y(k)=Cx(k)$ where $F=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -1 & -2 & -3\end{bmatrix}$ $g=\begin{bmatrix}0\\0\\1\end{bmatrix}$ $C=[1 \quad 0 \quad 0]$ The desired poles are at $z_1=0.5, z_2=0.6, z_3=0.7$ Design controller.	10	3	4
b	Design full order observer such that the observer poles are at 0.2 and 0.3 and system equations are $x(k+1)=\begin{bmatrix}0 & 20\\ 1 & 0\end{bmatrix}x(k)+\begin{bmatrix}0\\1\end{bmatrix}$u(k) $y(k)=\begin{bmatrix}0 & 1\end{bmatrix}x(k)$	10	4	4
5a	Explain the need of observer. Discuss the test used to check observability of the system Compare full and reduced order observers	10	4	2
b	Write a short note on output feedback controller	10	3	2
6a	Calculate the steady state errors for unit step, unit ramp and unit parabolic inputs for the unity feedback system shown below with $G_p(s)=\frac{8}{s(s+5)}$ *and* $T=1\,sec$	10	1	2

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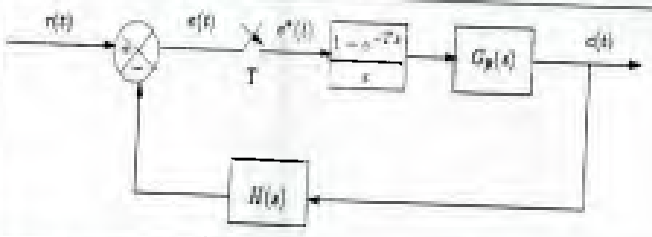
Reexamination February 2024

				
b	Consider the following discrete transfer function. $$G(z) = \frac{0.1z + 0.3}{z^2 - 1.2z + 0.32}$$ Write state space model in the following forms (i) Controllable Canonical form (ii) Observable canonical form (iii) Jordan Canonical form	10	4	04
7	Explain 1. Regulation and set point tracking 2. Sampling 3. Quantization 4. Dead beat controller 5. Lyapunov stability test	20	1-4	2

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester - December 2023 Examinations

Program: B. Tech. (Electrical) Sem VII

Course Code: PE-BTE706

Course Name: High Voltage Engineering

Duration: 3 hrs.

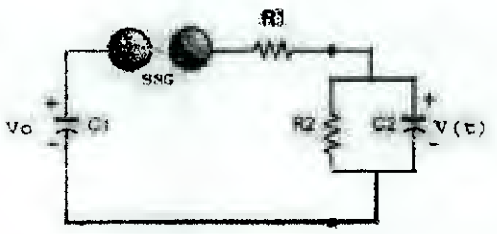
Maximum Points: 100

Semester: VII

3/12/23

Notes:

1. Question number 1 compulsory.
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams.
4. Assume suitable data if necessary.

Q.No.	Questions	Pts.	CO	BL	Mod. No.
1.(a)	What are the different power frequency test done on insulators? What is significance of impulse test? Briefly explain the impulse testing on insulators	15	2	L2	6
1.(b)	Explain in short which are important points considered for analysis of a given circuit in Fig. 1. What is the significance of analysis of a given circuit? **(Note : Don't derive equations)** 	05	3	L3	3
2.(a)	A 100 kVA, 400 V/250 kV testing transformer has 6% leakage reactance and 4% resistance on 100 kVA base. A cable has to be tested at 500 kV using the above transformer as a resonant transformer at 50 Hz. If the charging current of the cable at 500 kV is 0.4 A, find the series inductance required. Assume 1 % resistance for the inductor to be used and the connecting leads. Neglect dielectric loss of the cable. What will be the input voltage to the transformer?	10	2	L3	3

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End Semester - December 2023 Examinations

2.(b)	With the help of neat diagram explain in detail 1. construction and working principle of valve type light arrester 2. Significance of **By-pass gap** in valve type lightning arrester	**10**	2	L1	5
3.(a)	The suspended solid particle of paper and air pocket present in transformer oil with diameter 0.6 mm and 1.2 mm respectively. Find the force on each suspended particle if applied electric field is $E^2 = 12x + 4$ V/m Given: Relative permittivity of paper = 2.6 Relative Permittivity of transformer oil = 2	**06**	3	L3	2
3.(b)	Draw layout and explain operation of UHV Laboratory in detail.	**10**	4	L4	7
3.(c)	Explain in detail Paschen's theory for breakdown in gas insulating material.	**04**	1	L1	1
4.(a)	Draw neat diagram of equivalent circuit of single stage impulse generator. A twelve stage impulse generator has 0.126 μF capacitors. The wave front and wave tail resistances are 800 ohms and 5000 ohms respectively. If the load capacitance is 1000 pF, determine the wave front and wave tail times of the impulse wave.	**10**	2	L3	3
4.(b)	Derive expression for Townsend's first and secondary ionization coefficients. How is the condition for breakdown obtained in a Townsend's discharge?	**10**	1	L2	1
5.(a)	Explain 'Generating Voltmeter' for H.V. measurement and prove that $i_{rms} = \frac{VC_m\omega}{\sqrt{2}}$	**10**	2	L2	4

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End Semester - December 2023 Examinations

5.(b)	Explain the terms as referred to high voltage testing. **(Explain in short)** 1. Withstand voltage 2. Flashover voltage 3. 50% flash over voltage 4. Wet and dry power frequency tests 5. Chopped wave	**05**	1	L1	3
5.(c)	A generating voltmeter has to be designed so that it can have a range from 10 to 100 KV d.c. If the indicating meter reads a minimum current of 1.5 μA and maximum current of 18 μA, what should the capacitance of the generating voltmeter?	**05**	2	L3	5
6.	Explain the term 1. Partial discharge or internal discharge 2. Solid dielectric used in practice 3. Series-parallel resonance circuit for generation of high voltage AC 4. Characteristics of impulse voltage waveform 5. Series impedance voltmeter	**20**	1	L1	2,4,5
7.(a)	Explain in detail construction and working principle of Vaan de Graff generator.	**08**	1	L2	3
(b)	A solid specimen of dielectric has a dielectric constant of 4.2 and $tan\delta$ as 0.001 at a frequency of 50 Hz. If it is subjected to an alternating field of 50kV/cm, calculate the heat generated in the specimen due to the dielectric loss.	**04**	3	L3	2
(c)	Discuss the effect of stressed oil volume theory on the breakdown strength of liquids.	04	1	L2	2
(d)	Determine the electromechanical breakdown voltage stress of PMMC sheet 10 mm thick, relative permittivity 5.6 and Young's modulus 1000 kg/m^2 when subjected to an impulse voltage.	04	3	L3	3

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

Re-Examination February 2024

Program: B. Tech. (Electrical) Sem VII

Course Code: PE-BTE706

Course Name: High Voltage Engineering

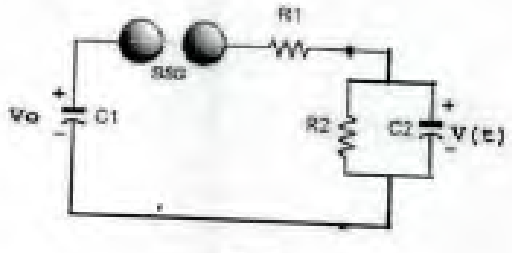
Duration: 3 hrs.

Maximum Points: 100

Semester: VII

Notes:

1. Question number 1 compulsory.
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams.
4. Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL	Mod. No.
1.(a)	A 100 kVA, 400 V/250 kV testing transformer has 6% leakage reactance and 4% resistance on 100 kVA base. A cable has to be tested at 500 kV using the above transformer as a resonant transformer at 50 Hz. If the charging current of the cable at 500 kV is 0.2 A, find the series inductance required. Assume 2 % resistance for the inductor to be used and the connecting leads. Neglect dielectric loss of the cable. What will be the input voltage to the transformer?	10	2	L3	3
1.(b)	A twelve stage impulse generator has 0.126 μF capacitors. The wave front and wave tail resistances are 800 ohms and 5000 ohms respectively. If the load capacitance is 1000 pF, determine the wave front and wave tail times of the impulse wave.	10	2	L3	3
2. (a)	Derive expression for wave front time and wave tail time of following Fig.1  Fig.1	14	2	L2	3

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(Government Aided Autonomous Institute)

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Re-Examination February 2024

2.(b)	The suspended solid particle of paper and air pocket present in transformer oil with diameter 0.6 mm and 1.2 mm respectively. Find the force on each suspended particle if applied electric field is $E^2 = 12x + 4$ V/m Given: Relative permittivity of paper = 2.3 Relative Permittivity of transformer oil = 2.2	06	3	L3	2
3.(a)	What are the different power frequency test done on insulators? What is significance of impulse test? Briefly explain the impulse testing on insulators	15	2	L2	6
3.(b)	Determine the electromechanical breakdown voltage stress of PMMC sheet 4 mm thick, relative permittivity 4 and Young's modulus 1000 kg/m^2 when subjected to an impulse voltage.	05	3	L3	3
4. (a)	Derive expression for Townsend's first and secondary ionization coefficients. How is the condition for breakdown obtained in a Townsend's discharge?	10	1	L2	1
4.(b)	With the help of neat diagram explain in detail 1. construction and working principle of valve type light arrester 2 significance of **By-pass gap** in valve type lightning arrester	10	2	L1	5
5.(a)	Explain 'Generating Voltmeter' for H.V. measurement and prove that $i_{rms} = \frac{VC_m\omega}{\sqrt{2}}$	10	2	L2	4
5.(b)	Draw layout and explain operation of UHV Laboratory in detail.	10	4	L4	6

6.	Explain the term 1. Partial discharge or internal discharge 2. Solid dielectric used in practice 3. Series-parallel resonance circuit for generation of high voltage AC 4. Characteristics of impulse voltage waveform 5. Series impedance voltmeter	**20**	1	L1	2,4,5
7.(a)	A generating voltmeter has to be designed so that it can have a range from 10 to 100 KV d.c. If the indicating meter reads a minimum current of 1.5 μA and maximum current of 18 μA, what should the capacitance of the generating voltmeter?	**05**	2	L3	5
7.(b)	A solid specimen of dielectric has a dielectric constant of 4.2 and $tan\delta$ as 0.001 at a frequency of 50 Hz. If it is subjected to an alternating field of 50kV/cm, calculate the heat generated in the specimen due to the dielectric loss.	**05**	3	L3	2
7.(c)	Discuss the effect of Suspended particle mechanism on the breakdown strength of liquids.	**05**	1	L2	2
7.(d)	Explain the terms as referred to high voltage testing. **(Explain is short)** 1. Withstand voltage 2. Flashover voltage 3. 50% flash over voltage 4. Wet and dry power frequency tests 5. Chopped wave	**05**	1	L1	3

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

REEXAM – FEBRUARY 2023 Examinations

Program: BTECH (MECH.ENGG.) / Sem VII **Duration:** 3 hrs.

Course Code: OE-BTM618 **Maximum Points:** 100

Course Name: Smart City for Sustainable Development **Semester:** VII

4/2/23

- Solve any 5 questions out of seven
- Figures to the right indicate full marks
- Draw neat sketches & figures wherever required

Q.No.	Questions	Points	CO	BL	PI
Q.1 (a)	Explain the concept of Industry 4.0 with neat figure? Also explain issues & challenges of Smart City?	[10]	1,2,3	2	3.2.1
(b)	Explain various steps in building smart cities along with neat figures?	[10]	1,2,3	2	3.2.1
Q.2 (a)	Explain the role of digital twin in building smart cities with neat sketches?	[12]	1,2,3	2	5.4.1
(b)	Explain the following • BIM interoperability • Benefits of Scan to BIM with neat sketches	[08]	1,2	2	5.4.1
Q.3 (a)	Explain the integration benefits of following enabling technologies with Smart Cities along with neat figures? • Mixed Reality • Augmented Reality • Virtual Reality	[20]	2,3	3	5.5.1
Q.4 (a)	Explain Smart Parking System (SPS) along with neat sketch? Also write the benefits of the same?	[10]	2,3	3	5.5.1
(b)	Explain Smart Waste Management (SWM) system along with neat sketch? Also write the benefits of the same?	[10]	1,2,3	2	5.5.1
Q.5 (a)	Explain Role of smart governance for smart cities development? Also explain various models of smart governance	[10]	3,4	3	5.5.1
(b)	Explain Future of Smart Cities? Also explain new business & revenue models with respect to Smart Cities	[10]	2,3	3	5.1.2

Q.6	What are Smart City monitoring IIOT Platforms? Explain how these platforms are useful to monitor smart cities? Explain any one IIOT platform along with their capabilities & architecture? Also Provide neat sketch of architecture.	[20]	3,4	3	5.5.1
Q.7	Write Short notes on (any three)	[20]	2,3,4	3	5.4.1, 5.5.1
	• Smart Economy • Smart Transportation • Smart Buildings • Smart Education • Smart Maintenance • Smart Environment				
********** All the Best **********					

11/12/23

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

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

End Sem Examination
December-2023

Max. Marks: **100**
Class: **B.TECH.** Semester: **VII**
Name of the Course: **Electrical Vehicle System Design**

Duration: **03 Hours**
Program: **B.TECH (Electrical)**
Course Code: **PE-BTE-709**

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 Social and Environmental Importance of Hybrid and Electric Vehicles?	**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	Compare on-board charger and off-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=800 kg, C_D=0.2, A_F=2.2 m^2, C_0=0.008, C_1=1.6*10^{-6} s^2/m^2 .Also, take density of air ρ=1.18 kg/m^3, and acceleration due to gravity g=9.81 m/s^2. The vehicle is on level road. It accelerates from 0 to 65 mph in 10 s, such that its velocity profile is given by $v(t) = 0.29055t^2$ **for 0≤ t≤10 s** (a) Calculate $F_{TR}(t)$ **for 0≤ t≤10 s.** (b) Calculate $P_{TR}(t)$ **for 0≤t≤10 s.** (c) Calculate the energy loss due to non-conservative forces E_{loss}.	**10**	**01**
Q.4 a	What is the series-parallel HEV architecture? Discuss its operation modes and compare it with other modes of operation.	**12**	**02**
Q.4 b	Draw the block diagram and Explain the general EV architecture.	**08**	**03**
Q.5 a	What is Electric Propulsion unit in EV. Discuss its components.	**10**	**03**
Q.5 b	What is regenerative braking in EV? Discuss the regenerative braking of three phase induction motor with torque speed characteristics.	**10**	**05**
Q.6 a	Discuss the V/F control of AC drive (induction motor) in closed loop mode.	**12**	**05**
Q.6 b	BLDC is considered as a suitable candidate for Electric vehicle application, justify the statement. Draw the waveform of Back-emf and ideal phase currents in the three phases of a PM brushless DC motor.	**08**	**01**
Q.7a	What are the different batteries used as energy storage. Compare these batteries based on following parameters: i) Cycle life ii) Efficiency iii) Specific power iv) Specific energy	**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**

3/11/23

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester - December 2023 Examinations

Program: Electrical B. Tech (EE) Sem VII **Duration:** 3h

Course Code: PE-BTE705 **Maximum Points:** 100

Course Name: Restructuring and Deregulation of Power System **Semester:** VII

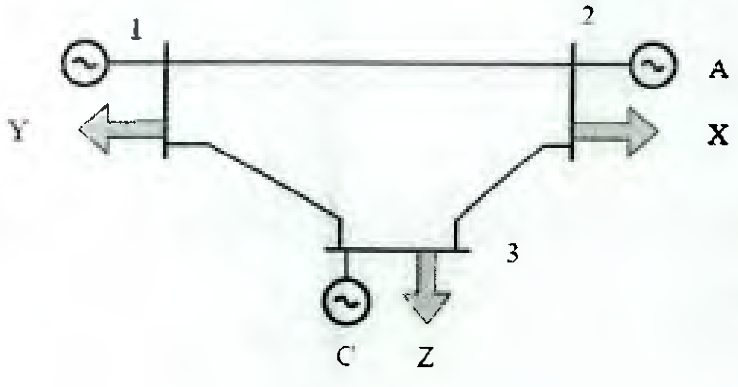
- All questions are compulsory
- Make suitable assumptions wherever necessary

Q.No	Questions	Points	CO	BL	Module
Q1.(a)	A manufacturer estimates that its variable cost for manufacturing a given product is given by the following expression: $C(q) = 25q2 + 2000q$ [₹] where C is the total cost and q is the quantity produced (i). Derive an expression for the marginal cost of production. (ii). Derive expressions for the revenue and the profit when the widgets are sold at marginal cost.	5	2	3	2
Q1.(b)	A small power system consists of two buses connected by three transmission lines. Assuming that this power system must be operated according to the N-1 security criterion and that its operation is constrained only by thermal limits on the transmission lines, calculate the maximum power transfer between these two buses for each of the following conditions (i). All three lines are in service and each line has a continuous thermal rating of 300 MW (ii). Only two lines rated at 300 MW are in service. (iii). All three lines are in service. Two of them have a continuous thermal rating of 300 MW and the third is rated at 200 MW. (iv). All three lines are in service. All of them have a continuous thermal rating of 300 MW. However, during emergencies, they can sustain a 10% overload for 20 min. The generating units on the downstream bus can increase their output at the rate of 4 MW per minute. (v). Same conditions as in (iv), except that the output of the downstream generators can only increase at the rate of 2 MW per minute.	5	4	3	6
Q1.(c)	The inverse demand function of a group of consumers for a given type of widgets is given by the following expression: $\pi = -10q + 2000$[₹] where q is the demand and π is the unit price for this product. For a price π of 1000 ₹/unit, calculate	5	2	3	2

	the consumption, the consumers' gross surplus, the revenue collected by the producers and the consumers' net surplus.				
Q1(d)	A power system is supplied by three generating units that are rated at 150, 200 and 250 MW, respectively. What is the maximum load that can be securely connected to this system if the simultaneous outage of two generating units is not considered to be a credible event?	**5**	**4**	**3**	**6**
Q2(a)	The Silvasa Power and Light Company owns one generating plant and serves some load. It has been actively trading in the electricity market and has established the following position for 1 January between 10 : 00 and 11 : 00 A.M.: ➢ Long-term contract for the purchase of 600 MW during peak hours at a price of 20.00 ₹/MWh ➢ Long-term contract for the purchase of 400 MW during off-peak hours at a price of 16.00 ₹/MWh ➢ Long-term contract with a major industrial user for the sale of 50 MW at a flat rate of 19.00 ₹/MWh ➢ The remaining customers purchase their electricity at a tariff of 21.75 ₹/MWh ➢ Future contract for the sale of 200 MWh at 21.00 ₹/MWh ➢ Future contract for the purchase of 100 MWh at 22.00 ₹/MWh ➢ Call option for 150 MWh at an exercise price of 20.50 ₹/MWh ➢ Put option for 200 MWh at an exercise price of 23.50 ₹/MWh. ➢ Call option for 300 MWh at an exercise price of 24.00 ₹/MWh. The option fee for all the options is 1.00 ₹/MWh. The peak hours are defined as being the hours between 8: 00 A.M. and 8 : 00 P.M. The outcome for 1 January between 10 : 00 and 11 : 00 is as follows: ➢ The spot price is set at 21.50 ₹/MWh. ➢ The total load of the Silvasa Power and Light Company is 1200 MW, including the large industrial customer. ➢ The power plant produces 300 MWh at an average cost of 21.25 ₹/MWh.	**12**	**1,3**	**3**	**2**

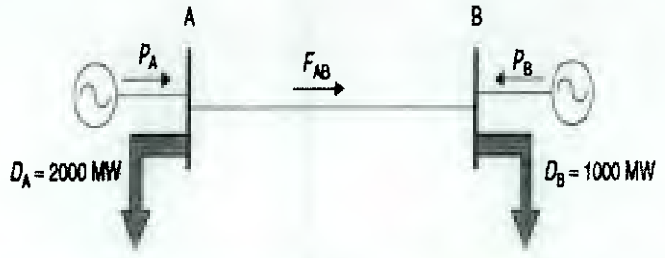
	Assuming that all imbalances are settled at the spot market price, calculate the profit or loss made by the company during that hour.				
Q2.(b)	Why Spot market is required? Who manages this market? Who can participate in spot market? What is the time frame for the operation of spot market?	8	2	2	2
Q3.(a)	Name and compare the two mechanisms through which system operators can obtain ancillary services.	10	4	2	6
Q3.(b)	In liberalized electricity markets, transmission is usually separated from the other components of a traditional, vertically integrated utility. Discuss in detail essential characteristic of transmission business.	10	4	2	7
Q4.(a)	Consider the power system shown in figure given below. Assuming that the only limitations imposed by the network are imposed by the thermal capacity of the transmission lines and that the reactive power flows are negligible, check that the following set of transactions are simultaneously feasible.	10	4	3	4

Branch	Reactance (pu)	Capacity (MW)
1-2	0.2	250
1-3	0.4	180
2-3	0.4	250



Seller	Buyer	Amount
B	X	200
A	Z	400
C	Y	300

Q4.(b)	Explain with the help a neat diagrams different models of competition in electricity sector. Also explain which model provides the choice to the small residential consumers to choose their service provider.	10	1	2	1
Q5.(a)	The rules of the Silvasa electricity market stipulate that all participants must trade energy exclusively through the Power Pool. However, the Silvasa Aluminum Company (SALCo) and the Northern Silvasa Power Company (NSPCo) have signed a contract for difference for the delivery of 200MW on a continuous basis at a strike price of 16 ₹/MWh (i). Trace the flow of power and money between these companies when the pool price takes the following values: 16 ₹/MWh, 18 ₹/MWh and 13 $/MWh. (ii). What happens if during one hour the Northern Silvasa Power Company is able to deliver only 50 MWh and the pool price is 18 ₹/MWh? (iii). What happens if during one hour the Silvasa Aluminum Company consumes only 100MWh and the pool price is 13 ₹/MWh?	08	5	3	4
Q5.(b)	Consider the two-bus power system shown in figure. The marginal cost of production of the generators connected to buses A and B are given respectively by the following expressions: $MC_A = 30 + 0.005P_A$ ₹/MWh $MC_B = 15 + 0.02P_B$ ₹/MWh Assume that the demand is constant and insensitive to price, that energy is sold at its marginal cost of production and that there are no limits on the output of the generators. Calculate the price of electricity at each bus, the production of each generator and the flow on the line for the following cases: (i).The line between buses A and B is disconnected (ii). If the line connecting A and B has unlimited capacity. (iii). The line between buses A and B is in service and has an unlimited capacity, but the maximum output of Generator A is 900MW. The output of Generator B is unlimited.	12	4	3	4

	(iv). The line between buses A and B is in service but its capacity is limited to 100MW. The output of the generators is unlimited. And also calculate merchandising surplus.  				
Q6.(a)	Incremental fuel cost in ₹/MWh for a plant consisting of two units are given by $MC_1=0.008P_1+8.0$ $MC_2=0.0096P_2+6.4$ Assume that both units are operating at all times, that load varies from 250 to 1250 MW, and that the maximum and minimum loads on each unit are to be 625 and 100MW, respectively. Find the incremental fuel cost of the plant and the allocation of the load between units for the minimum cost of various total load.	12	3	3	3
Q6.(b)	Answer the following: (i). List out different types of Electricity markets. (ii).What are the advantages and disadvantages of trading in these market? (iii).Difference between firm and non-firm contracts. (iv).How settlement is done in these markets.	8	4	3	
Q7.	Write short note on the following on two: (i). Electricity act 2003 first steps towards green grid. (ii).Electricity is different from other commodities traded in market. (iii).Methods of allocating cost of transmission	20	4	1,2	7,1,7

Bharatiya Vidya Bhavan's

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End Sem Examination January-2024

Max. Points: **100**
Class: **Electrical** B Tech CE Sem VII
Course Code : **PE-BTE-707**
Name of the Course: **Power Electronics Application in Power System**

Duration: **03 Hours**
Program: **B.Tech.**
Sem.: **VII**

3/11/24

Instructions:

- Question no.1 is compulsory
- Solve any four from remaining 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.**

Ques. No	Description of Question	Max. Pts.	C.O.
Q.1 a.	When nonlinear load is connected, the voltage at PCC gets polluted. Justify.	05	02
b.	What are the characteristics of ideal compensator?	05	01
c.	What are the advantages of instantaneous reactive power compensation?	05	03
d.	The voltage is injected in series with line and at any phase angle with respect to source voltage. Discuss the effect on active and reactive power flow with suitable phasor diagram.	05	01
Q.2 a.	The Synchronous Link Converter Var Compensator (SLCVC) where DC link voltage is controlled to vary the reactive power. In this method, discuss the variation of load angle delta when reference value of reactive power is increased and reference value of reactive power is decreased.	12	03
b.	What is the peak value of output phase voltage and line voltage of inverter in case of square wave inverter technique? Compare these values with space vector modulation technique.	08	03
Q.3 a.	The STATCOM is ideal and controlled using SINE-Δ PWM method with modulation index, m=0.9. The source voltage is given by: $Vs=300\sin(100\pi t)$ and value of inductance is 50 μH.	08	03

	Calculate the fundamental component of inverter output voltage to supply the: i) 50 KVAR lagging reactive power. ii) 50 KVAR leading reactive power.		
b.	Derive the instantaneous active and reactive power in terms of two phase stationary reference frame (alpha-beta) components.	**08**	**03**
c.	What are the features of active filter?	**04**	**01**
Q.4 a.	What is instantaneous reactive current? Draw the block diagram and explain in detail the instantaneous reactive power compensation.	**12**	**01**
b.	Prove that when mid-point compensation is used (as a voltage regulator) the reactive power requirement of transmission line is four times the maximum active power flow over transmission line.	**08**	**03**
Q.5 a.	What is Harmonic Oscillator? Discuss the need of Harmonic Oscillator in phase locked loop (PLL).	**12**	**01**
b.	Compare TCR and TSC with suitable waveforms.	**08**	**03**
Q.6 a.	Convert the three phase sinusoidal quantities to two phase sinusoidal quantities (three phase stationary to two phase stationary). What is the significance of stretching factor in three phase to two phase conversion?	**12**	**03**
b.	With suitable waveforms, discuss the operation and control of FC-TCR.	**08**	**03**
Q.7a.	What are the ways to control series compensation? Discuss the operation of GCSC. Explain the possible modes of operation.	**12.**	**01**
b.	Discuss the operation of STATCOM with inner current loop to control active and reactive power.	**08**	**01**