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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

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

Odd Semester Re-examination January 2020 (Old course)

Max. Marks: **100** Duration: **3.00 Hrs**

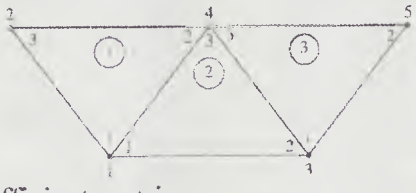
Class: **B. Tech. (Electrical)** Semester: **VII** Program: **Electrical Engineering**

Name of the Course: **High Voltage Engineering** Course Code : **BTE408**

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

Question No		Maximum Marks	Course outcome No.	Module No.
Q1(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 $E^2 = 2x^2\overline{a_x} + 4y\bar{a}_y + 3\overline{a_z}$ at (2,0,0) Given: Relative permittivity of paper = 2.3 Relative Permittivity of transformer oil = 2.2	**07**	**02**	**03**
(b)	A 100 kVA, 400 V/500 kV testing transformer has 8% leakage reactance and 2% resistance on 100 kVA base. A cable has to be tested at 800 kV using the above transformer as a resonant transformer at 50 Hz. If the charging current of the cable at 800 kV is 0.2 A, find the series inductance required. Assume 4% 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**	**02**	**05**
(c)	What is critical threshold distance for sustained discharge if $\alpha = 2.43/cm$ and $\gamma = 6.823 \times 10^{-4}$.	**03**	**01**	**02**
Q2(a)	Derive expression for Townsend's first and secondary ionization coefficients. How is the condition for breakdown obtained in a Townsend's discharge?	10	**01**	**02**
(b)	Discuss the effect of following parameters on the breakdown strength of liquids : a) Hydrostatic pressure b) Solid impurities c) Moisture content in the oil	**10**	**03**	**03**

Q3(a)	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 50 kV/cm, calculate the heat generated in the specimen due to the dielectric loss.	**03**	**02**	**04**
(b)	Explain the term **(Any four)** 1. Partial discharge or internal discharge 2. Solid dielectric used in practice 3. Series-parallel resonance circuit for generation of high voltage AC 4. AC electric field strength meter 5. Characteristics of impulse voltage waveform 6. Series impedance voltmeter	**12**	**01,03**	 **04** **04** **05** **06** **05** **06**
(c)	How is the Electric stress/electric field intensity controlled?	**05**	**01**	**01**
Q4(a)	What is "finite element method"? Give the outline of this method for solving the field problems. Find global coefficient matrix of following shape  If local coefficient matrix are, $[C^{(1)}] = \begin{bmatrix} 1.35 & -0.77 & -0.45 \\ -0.77 & 0.69 & 0.08 \\ -0.45 & 0.08 & 0.37 \end{bmatrix}$ $[C^{(2)}] = \begin{bmatrix} 0.52 & -0.45 & -0.1 \\ -0.45 & 0.82 & -0.36 \\ -0.1 & -0.36 & 0.46 \end{bmatrix}$ $[C^{(3)}] = \begin{bmatrix} 1.71 & 0.22 & -0.45 \\ 0.22 & 0.96 & -0.21 \\ -0.45 & -0.21 & -0.82 \end{bmatrix}$	**10**	**03**	**01**
(b)	Describe with neat sketch generation of high voltage more than 300 KV at power frequency for testing electrical apparatus.	**10**	**01**	**05**
Q5(a)	Draw neat diagram of equivalent circuit of single stage impulse generator. A twelve stage impulse generator has 0.080 μF condenser for each three stages. The wave front and wave tail resistances are 105 ohms and 2850 ohms respectively. If the load capacitance is 2.5 nF, determine the wave front and wave tail times of the impulse wave.	**10**	**01**	**05**
(b)	Explain 'Generating Voltmeter' for H.V. measurement and prove that $i_{rms} = \frac{VC_m\omega}{\sqrt{2}}$	**10**	**01**	**06**

Q6(a)	Explain the Streamer theory of breakdown in air at atmospheric pressure.	**05**	**01**	**02**
(b)	Draw and explain test cell and closed cycle purification system for reconditioning of transformer oil.	**05**	**01**	**03**
(c)	What are the criteria used in selecting ratings of the testing equipment for HV laboratories?	**10**	**04**	**07**
Q7 (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 be?	**05**	**02**	**06**
(b)	Draw layout and explain operation of UHV Laboratory of Central Power Research Institute , Bangalore	**10**	**04**	**07**
(c)	Explain in detail "Post breakdown phenomenon and its applications" in gases.	**05**	**01**	**02**

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Re-Examination Jan-2020

Max. Marks: **100** Duration: **03 Hours**
Class: **B.TECH.** Semester: **VII** Program: **B.TECH (Electrical)**
Name of the Course: **Electrical Drives** Course Code : **PC-BTE 701**

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		Max. Marks		
Q.1 a)	What are the advantages of closed loop control of drive system?	05		
b)	What are the different components of load torque?	05		
c)	Justify the following operations in case of three phase Induction Motor. (i) Voltage is maintained constant at rated value and frequency is increased (ii) Voltage is reduced and frequency is maintained at its rated value	05		
d)	What are the functions of power modulator?	05		
Q.2 a)	What is Static Ward Leonard Drive? Discuss constant torque operation and constant power operation of separately excited dc motor.	10		
b)	A motor equipped with a flywheel has to supply a load torque of 600 N-m for 10 sec. followed by a no load period long enough for the flywheel to regain its full speed. It is desired to limit the motor torque to 450 N-m. What should be the moment of inertia of flywheel? The no load speed of the motor is 600 rpm and it has a slip of 8% at torque of 400 N-m. Assume the motor speed-torque characteristics to be straight line in the range of operation. Motor has an inertia of 10 kg-m^2.	10		
Q.3 a)	What is steady state stability of operating point of an electrical drive system? Derive the condition for the steady state stability of the operating point.	10		

b)	Discuss the four quadrant operation of a drive system.	10		
Q.4 a)	Draw the circuit diagram and explain the operation of regenerative braking operation of separately excited dc motor with chopper.	10		
b)	A 440 V, 3-Ph, 50Hz, 6 pole, 945 rpm delta connected induction motor has following parameters referred to stator: $R_S = 2\ \Omega$, $R_r' = 2\ \Omega$, $Xs = 3$, $Xr' = 4.0\ \Omega$. When driving the fan load at rated voltage it runs at rated speed. The motor speed is controlled by stator voltage control determine: (i) Motor terminal voltage, current and torque at 800 rpm (ii) Motor speed, current and torque for terminal voltage of 280 V.	10		
Q.5 a)	What is the purpose of plugging type of braking in three phase induction motor? Discuss it with suitable torque speed characteristics.	10		
b)	Discuss the static resistance control of three phase slip ring induction motor.	10		
Q.6 a)	What are the effects of unbalanced source voltages on the operation of three phase induction motor? Discuss the worst case of unbalanced operation of three phase induction motor	14		
b)	Compare ac drive and dc drive.	06		
Q.7a)	Draw the block diagram and explain the closed loop control of V/F control of three phase induction motor.	10		
b)	Stator voltage control is preferred for the load where load torque varies as a square of speed. Justify it.	10		

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Class: **B. Tech. (Electrical)** Semester: **VII** Program: **Electrical Engineering**
Name of the Course: **High Voltage Engineering** Course Code : **BTE408**

Instructions:

1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
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Question No		Maximum Marks	Course outcome No.	Module No.
Q1(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 $E^2 = 2x^2\overline{a_x} + 4y\bar{a}_y + 3\overline{a_z}$ at (2,0,0) Given: Relative permittivity of paper = 2.3 Relative Permittivity of transformer oil = 2.2	**07**	**02**	**03**
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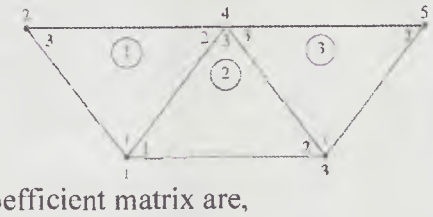
Q4(a)	What is "finite element method"? Give the outline of this method for solving the field problems. Find global coefficient matrix of following shape  If local coefficient matrix are, $[C^{(1)}] = \begin{bmatrix} 1.35 & -0.77 & -0.45 \\ -0.77 & 0.69 & 0.08 \\ -0.45 & 0.08 & 0.37 \end{bmatrix}$ $[C^{(2)}] = \begin{bmatrix} 0.52 & -0.45 & -0.1 \\ -0.45 & 0.82 & -0.36 \\ -0.1 & -0.36 & 0.46 \end{bmatrix}$ $[C^{(3)}] = \begin{bmatrix} 1.71 & 0.22 & -0.45 \\ 0.22 & 0.96 & -0.21 \\ -0.45 & -0.21 & -0.82 \end{bmatrix}$	**10**	**03**	**01**
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SARDAR PATEL COLLEGE OF ENGINEERING

Test 1

RE- EXAM SEM-VII

JANUARY 2020

Program: Electrical Engineering. **Duration: 03Hr**

Course Code: PE-BTE707 **Maximum Points: 100**

Course Name: POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS **Semester: VII**

NB: Answer any five questions out of seven (Qs.1 to Qs.7).
Draw neat circuit diagrams wherever necessary to support your answer.
Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL	PI
I	Illustrate the following with supporting diagrams and phasors : a. Mid-point series and shunt compensation using passive elemnts. b. Load balancing applied for an unbalanced 3-Φ complex linear load supplied with a balanced 3-Φ voltage.	 12 08	 01 01	 03 03	 2.3.1 2.3.2
II	Explain the following with neat diagrams: a. Indirect Current Controlled Synchronous Link Converter Var Compensator (SLCVC). b. Various PWM techniques and Harmonic elimination.	 10 10	 01 03	 02 02	 2.4.3 2.4.2
III	Compare the performance of VSC based shunt reactive power compensator and shunt reactive power compensator using passive elements at a power system bus. Support your answer with neat circuit representations, phasor diagrams and V-I characteristics	20	02	05	2.4.1
IV	Illustrate the basic principle & control capabilities of Unified Power Flow Controller (UPFC) with neat Schematic / Single line / phasor diagrams.	20	03	04	2.4.2

Test 1
August 2018
RE- EXAM SEM-VII

JANUARY 2020

V	Illustrate the following: a. Operating modes and V-I characteristic of Thyristor Controlled Series Capacitor (TCSC). b. Effect of Static Synchronous Series Compensator (SSSC) on P-δ curve.	10 10	02 02	05 05	2.4.3 2.4.3
VI	Explain the following: a. Effect of source inductance in the operation of a six pulse converter. b. Valve blocking and By-passing in a converter bridge.	10 10	02 03	03 03	2.3.1 2.3.2
VII	Illustrate the following: a. HVDC Power transmission via underground/undersea cables using modern technology. b. Mode stabilization & Voltage Dependent Current Order Limit.	10 10	02 03	05 03	2.4.2 2.3.2

(2)

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SARDAR PATEL COLLEGE OF ENGINEERING

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RE-EXAM JANUARY 2020

SEMESTER VII

Program: Electrical Engineering. **Duration: 03Hrs**

Course Code: PE-BTE701 **Maximum Points: 100**

Course Name: WIND AND SOLAR ENERGY SYSTEMS **Semester: VII**

NB: Answer any five questions (Q.No.I to Q.No.VII) .
Draw neat circuit diagrams wherever necessary to support your answer.
Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL	PI
I	a. Using Betz model of expanding air-stream tube, illustrate the relation between available power in the wind and the power that can be extracted from it.	12	02	03	2.3.1
	b. Illustrate the following terms with reference to the performance of wind turbines. a. Pitch control b. Yaw control c. Tip-speed ratio d. Maximum power coefficient	08	02	03	2.3.2
II	a. The following data were measured for a HAWT: Speed of wind = 20m/s; Air density=1.177kg/m^3; Rotor diameter = 80m; speed of rotor = 40rpm; calculate the torque produced at the shaft for maximum output of the turbine	10	02	02	2.3.2
	b. Compare the performance of fixed speed wind turbines using induction machines and wind turbines with Permanent-magnet synchronous generator.	10	03	03	2.3.2
III	Illustrate the operation and performance of a Doubly Fed Induction Generator (DFIG) based wind turbine generation system, with the converter topology used, while meeting the challenges when connected to the grid.	20	03	04	2.3.2

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RE-EXAM JANUARY 2020

SEMESTER VII

IV	**a.** Name and Compare different MPPT algoriths used in PV systems.	10	03	03	2.3.2
	b. Calculate the angle of incidence (θ) of beam radiation on a flat plate collector, pointing due south location at (28° 345′ N, 77° 12′ E) at 9.00 hour, solar time on December 1. The collector is tilted at an angle of 30° with horizontal. Also calculate the day length. Where, $\cos\theta = \sin\phi\,(\sin\delta\cos\beta + \cos\delta\cos\gamma\cos\omega\sin\beta) + \cos\phi\,(\cos\delta\cos\omega\cos\beta - \sin\delta\cos\gamma\sin\beta) + \cos\delta\sin\gamma\sin\omega\sin\beta$ Where: ϕ = Latitude of a location, β - slope; γ = surface azimuth angle, δ = Declination angle, ω - hour angle. Also $\delta = 23.45\sin\{(360/365)(284+n)\}$ n = day of the year	10	02	03	2.4.1
V	**a.** illustrate the effect of shading of a PV module on its performance & suggest solutions to overcome those problems.	10	02	03	2.3.1
	b. Discuss the various Power electronic converters used in solar PV system:	10	03	03	2.3.1
VI	Illustrate the following with the support of relevant diagrams: **a.** Integration of Wind & Solar energy system into an existing Power system.	10	04	04	2.3.2
	b. A clean distributed electrical energy production. Support your answer with relevant diagrams.	10	04	05	2.3.2
VII	Discuss on the following: a. Fault ride-through for wind farms & behavior of wind farms during grid disturbances	10	02	03	2.4.1
	b. Use of Flat Plate Collectors and Concentrators for thermal power generation.	10	02	02	2.3.2