

Bharatiya Vidya Bhavan's



Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai - 400058.
RE-EXAMINATION JUNE 2018

Program: Electrical Engg.
Duration : 3 Hours
Maximum Marks : 100
Name of the Course: **INDUSTRIAL AUTOMATION**

Date : June 2018
Course Code : BTE433
Semester- VIII

Instructions:

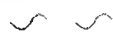
- Solve any 5 questions
- Assume suitable data if necessary give justifications for the same

Q. No		Max Mark	Co No	Mod No.
Q1a	Define Industrial Automation. Explain importance of quality in automation system. Explain different types of operating windows in DCS.	8	1	1
b	What are the types of control loops in control system? Explain with examples.	6	1	1
c	Explain 5 tier concept of Automation with example.	6	3	5
Q2a	Explain significance and purpose of following Engineering documents. a) Instrument Index b) Instrument I/O list c) Instrument Datasheet d) Instrument Hook up Diagram e) Instrument Loop Diagram	10	3	3
b	What Does PBD, PFD and P&ID mean? Please explain what does PBD, PFD and P&ID include.	6	1	3
c	What is protocol? Provide 2 examples	4	1	5
Q3a	What is DCS? What are the types of System Configuration in DCS? Explain with Diagram in details.	10	1	5
b	Mention 4 DCS manufacturer company name? Why redundancy is important in DCS?	6	1 & 3	5
d	What is graphics and Logics? What are the programming languages used for writing logics in DCS?	4	1	5
Q4a	Explain the 7 Layer Communication Model with example	8	1	6
b	What are the full form of FAT and SAT? Explain the procedure.	4	3	4
c	What is P, I and D control? Explain in details. What is Tuning? Explain the Tuning process in details.	8	1	2
Q5 a	What is Response Time? What is Resolution, Linearity & Accuracy	8	4	6
b	Define MTTR & MTBF? What is the importance of MTBF in Industry?	4	4	6

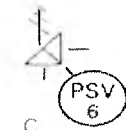
c	Explain following instructions: RTO and CTD	4	1	5
d	Write a PLC program to sequentially start two motors. There are two motors M1 and M2. M2 should not start unless motor M1 is running. Both motors stop with a single stop command.	4	3	7
Q6a	What is PLC? Explain key elements/components of PLC system and its function (Architecture).	8	1	5
b	What are the functionality of SCADA?	4	1	5
c	What is the difference between PLC & DCS?	8	2	5
Q7 a	Write a program to fill hundred bottles once the plant is started. It is assumed that it takes fixed amount of time (5 sec) for filling a bottle. Details of input and output devices is as follows: inputs: start push button (NO), stop push button (NC), limit sensor indicating presence of a bottle at filling station (NO). Outputs: indicators (green lamp: plant running, red lamp: plant stopped), motor for running the conveyer belt.	10	3	7
b	Match the symbols shown below with their correct description. (Images & options are provided below) . {Pneumatic Line , Discrete Instrument - Primary Location Normally accessible to operator , Safety Valve, Discrete Instrument - Auxiliary Location Normally accessible to operator , Board mounted Electronic Level Controller, Butterfly Valve, Back Pressure Regulator - Self contained, Internal system link - Software or data link, Discrete Instrument normally Inaccessible (Behind the panel), Shared Display or Control primary location Normally accessible to operator, Electronic or sonic signal not guided, Electric or Electronic signal, Variable area meter (Rotameter), Control valve - Pneumatic actuator Fail Open, Electric or Electronic signal, Discrete Instrument - Field mounted, Control valve - Fail closed, Pneumatic Binary Signal, Pressure Indicator, PLC - Primary Location Normally Accessible to operator}	10	1	3



A



B



C



D



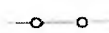
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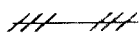
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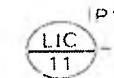
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End Semester Exam

May 2018

Max. Marks: 100

Duration: 3.00 Hrs

Class: B. Tech. (Electrical)

Semester: VIII

Program: Electrical Engineering

Name of the Course: Electric Traction

Course Code : BTE428

Instructions:

1. Question number one is compulsory.
2. Solve any four questions from remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary

Que. No		Max. Marks	CO No.	Mod. No.
Q.1(a)	A train is accelerated at a uniform rate up to a maximum speed of 48 km/hr in 24 second. Then the power is shut off and train coasts for 69 second against a constant train resistance. The train is braked at 3.2 km/hr/sec retardation during 11 sec. 1) Calculate the distance between stations. 2) Calculate the scheduled speed if the stoppage at the stations is 20 Sec.	07	1	01
(b)	How to save energy with series parallel starting? How to calculate efficiency of starting by using series parallel control for four motors?	10	1	03
(b)	What is coefficient of adhesion? Which factors affect on coefficient of adhesion?	03	1	01
Q.2 (a)	Two 600 V motors are started by series parallel control. Each motor takes 450 A during starting time of 240 Sec. and has 0.2 Ω resistance. Calculate : a) Energy lost in starting rheostat b) Energy lost in motor c) Motor output d) Total energy input from line e) Efficiency of starting	10	1,2	03
(b)	Write short note on "Modern trends (future scope) of Electric Traction in India"	05	3	01
(c)	Write short note on "Application of Induction Motors for Traction purpose"	05	1	02



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RE-EXAMINATION JUNE 2018

Program: Electrical Engg.
Duration : 3 Hours
Maximum Marks : 100
Name of the Course: INDUSTRIAL AUTOMATION

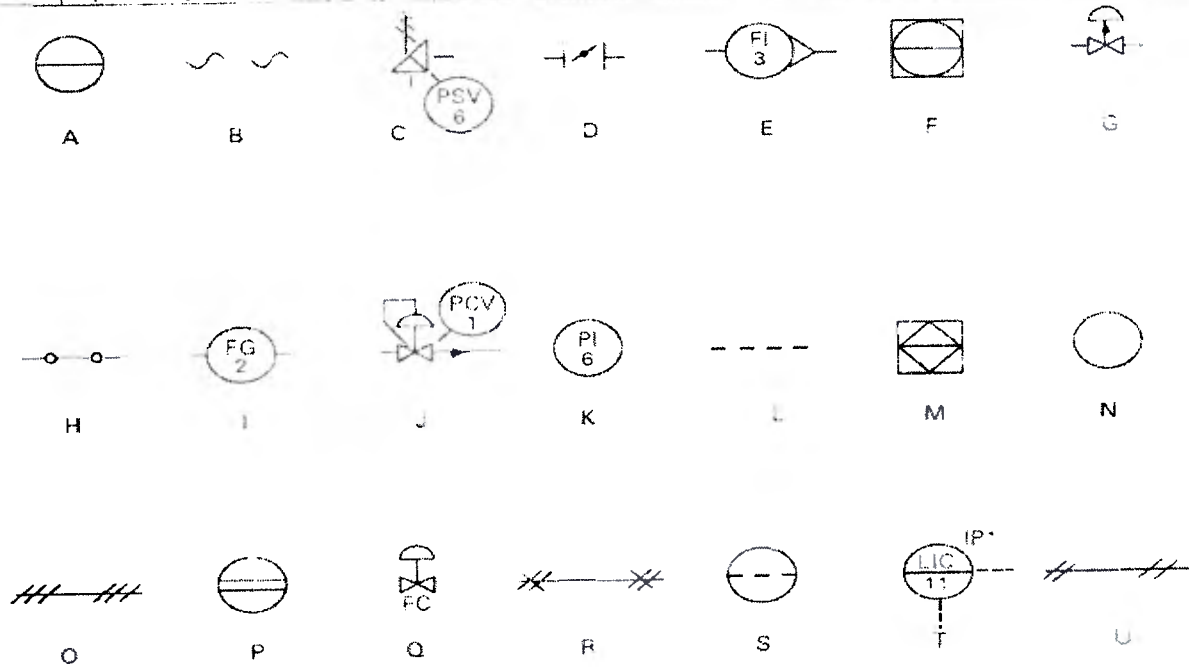
Date : June 2018
Course Code : BTE433
Semester- VIII

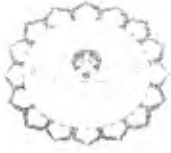
Instructions:

- Solve any 5 questions
- Assume suitable data if necessary give justifications for the same

Q. No		Max Mark	Co No	Mod No.
Q1a	Define Industrial Automation. Explain importance of quality in automation system. Explain different types of operating windows in DCS.	8	1	1
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b	Mention 4 DCS manufacturer company name? Why redundancy is important in DCS?	6	1 & 3	5
d	What is graphics and Logics? What are the programming languages used for writing logics in DCS?	4	1	5
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b	What are the full form of FAT and SAT? Explain the procedure.	4	3	4
c	What is P, I and D control? Explain in details. What is Tuning? Explain the Tuning process in details.	8	1	2
Q5 a	What is Response Time? What is Resolution, Linearity & Accuracy	8	4	6
b	Define MTTR & MTBF? What is the importance of MTBF in Industry?	4	4	6

c	Explain following instructions: RTO and CTD	4	1	5
d	Write a PLC program to sequentially start two motors. There are two motors M1 and M2. M2 should not start unless motor M1 is running. Both motors stop with a single stop command.	4	3	7
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End Semester Exam
May 2018



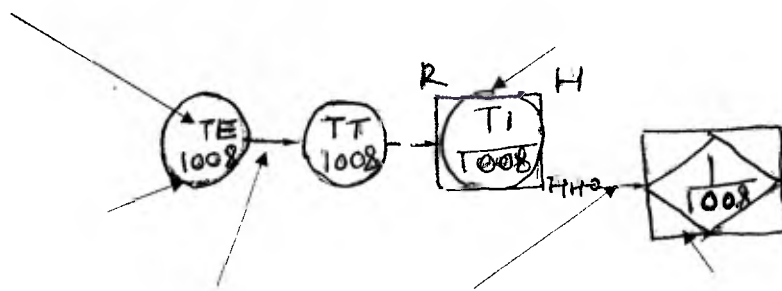
Max. Marks: 100
Class: Final Year (Electrical) · Semester: VIII
Name of the Course: **Elective – I Industrial Automation**

Duration: 3 Hr.
Program: B.Tech
Course Code : BTE433

Instructions: Please answer any 5 out of 7. Please write to the point answer and elaborate wherever is required.

Q. No	Question	Max Marks	Mod No.
Q1) a)	What is DCS? What are the types of System Configuration in DCS? Explain with Diagram in details.	6	5
b)	What is graphics and Logics? What are the programming languages used for writing logics in DCS? Why redundancy is important in DCS?	6	5
c)	What is the difference between PLC & DCS?	6	5
d)	Mention 4 DCS manufacturer company name?	2	5
Q2) a)	Compare following instructions 1) TON and TOF 2) TON and CTU 3) Examine If Open and examine if closed Justify your statements with the help of industrial applications.	12	5
b)	Write a PLC program for following process: There are three motors which are to be sequentially turned ON. There are two push buttons both of NO type, one used for giving start command and one for stop command. When start push button is pressed first motor starts immediately. Second motor starts after 50 seconds and third after 2 minutes. All the motors stop simultaneously when stop push button is operated. Note: Do this automation using single timer element.	08	5
Q3) a)	Define Automation?	2	1
b)	What are the type of control loops in control system? Explain with examples. What is protocol? Provide 2 examples.	8	1
c)	Explain 5 tier concept of Automation with example.	6	1
d)	What are the benefits of Automation?	4	1
Q 4) a)	What is PID tuning? Considering following points compare process reaction curve method with sustained oscillation method of PID Tuning. i) System Setup (closed/open loop) ii) Systems constraints / restrictions iii) Number of tests	12	2

	iv) Test signal requirements v) Advantages vi) Disadvantages Define the rules for both the tuning methods.		
b)	Explain Relay experiment method of PID tuning.	08	2
5) a)	Explain the 7 Layer Communication Model with example.	6	5
b)	What are the full form of FAT and SAT? Explain the procedure.	4	4
c)	What is the full form of SCADA? Explain the application of SCADA.	4	5
d)	Draw system architecture of PLC and explain in details.	6	5
Q6 a)	What is Response Time?	2	6
b)	Define MTTR & MTBF? What is the importance of MTBF in Industry?	6	6
c)	What is Resolution, Linearity & Accuracy	6	6
d)	Explain importance of Quality & Safety System in the Industry.	6	4
Q 7) a)	What is purpose of P&I Diagram in any project? What does it include?	5	3
b)	Please mention any 5 Instrument Identifier for following. a. FC b. PT c. FCV d. LIC e. PDR f. LSH g. ZSO	5	3
c)	Explain the project cycle process in any organization.	4	3
d)	Draw below diagram and mention what each item marked with Arrow means and explain its significance in one line. a. Instrument Tag Identification b. Instrument Symbol c. Electric Signal d. Software signal e. Interlock f. Control Function	6	3





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Examination: END-SEMESTR

Academic Year 2017 -18



Q. P. Code:

Duration: 03 Hrs

Program: UG

Max. Marks: 100

Class: BTech (Electrical)

Semester: VIII

Name of the Course: POWER QUALITY

Course Code : BTE432

Instructions:

Answer any five questions (Qs.I to Qs.VII)

Assume suitable data & necessary neat diagrams wherever required.

Question No		Maximum Marks	Course Outcome Number	Modu Numb
Qs. I	a. Define the following terms of power quality as per IEEE 1159 standard: (i) Short duration voltage variations (ii) Long duration voltage variations	10	1	1
	b. Mention the importance of power quality from application point of view	10	1	1
Qs. II	a. What are the various causes of voltage flicker and their effects?	10	1	2
	b. Define short term (Pst) & long term (Plt) flickers and various means to reduce it.	10	2	2
Qs. III	a. Explain economic impact of voltage sag.	10	2	3
	b. Explain the voltage sag result analysis representation by CBEMA, ITIC, SEMI, F47 curves	10	2	4
Qs. IV	a. Explain the Concept of Area of vulnerability	05	2	4
	b. Explain the Mitigation measures for voltage sag.	15	4	4
Qs. V	Explain the following with reference to power quality: a. Voltage v/s Current distortion	05	3	5
	b. Causes and effects of harmonics on different equipments.	15	3	5

Qs. VI	Explain the following			
	a. Briefly narrate on different computer tools for transient analysis	05	3	6
	b. What are the load switching related transient problems	05	3	6
Qs. VII	c. State and explain different transient voltage surge suppression circuits applied for electrical distribution systems of sensitive electronic equipment and communication systems.	10	3	6
	Answer any two from the following:			
	a. What are the objectives of Power Quality monitoring and its process?	10	4	7
	b. How are the following equipments support in Power Quality monitoring: (i) Disturbance Analyzer, (ii) Smart Power Quality meter	10	4	7
	c. State and explain various parameters used to monitor Power Quality.	10	4	7



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ENDSEMESTER

Program: Electrical Engg
Duration: 3 hr.
Maximum Marks: 100
Name of the Course: **ROBOTICS**

Date: MAY 2018
Course code: BTE431
Semester: VIII

Instructions:

- Solve any 5 questions.
- Assume suitable data if necessary give justifications for the same

Question No.	Question	Max points	CO. No	Mod No.
Q1)	a) What is the essential feature that distinguishes soft automation from hard automation?	05	1	1
	b) Briefly describe the four basic configurations of arm in robotic manipulator?	05	1	1
	c) Explain transformation matrix?	05	2	2
	d) With suitable example explain the importance of inverse kinematics?	05	3	3
Q2)	a) What is trajectory planning? State different terms used in trajectory planning.	10	4	5
	b) Explain the steps in trajectory planning?	10	4	5
Q3)	a) What is SCARA robot? Explain with neat diagram the configuration of SCARA.	10	3	2
	b) Obtain the direct kinematic equation of the 4-DOF SCARA robots.	10	3	2
Q4)	a) Which of the kinematic parameters are variable for a revolute joint? Which are variable for a prismatic joint?	10	2	2
	b) Find a numerical example which shows that the order in which a rotation and a translation are performed does affect the final relationship between two initially coincident coordinate frames. Specify the coordinate transformation matrices, and sketch the sequence of position.	10	3	2
Q5)	a) Explain the Pick and Place operation with suitable	10	4	5

		example.			
	b)	With suitable example explain the D-H algorithm.	10	3	2
Q6)	a)	Define the followings a. Joint Space Trajectory Planning, b. Cartesian Space Trajectory Planning,	10	4	5
	b)	Explain Trajectory Generation and Path Update rate	10	4	5
Q7)	a)	Define workplace, work volume, workspace dexterous and reachable workspace.	10	3	4
	b)	Explain work envelope with suitable example.	10	3	4

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 Examination: END-SEMESTER
 Academic Year 2017-18

Q. P. Code:
 Duration: 03 Hrs
 Program: UG

Max Marks: 100

Class: **BTech (Electrical)**

Semester: **VIII**

Name of the Course: **POWER ELECTRONICS APPLICATION IN POWER SYSTEM**

Course Code: **BTE427**

Instructions:

Answer any five questions (Qs.I to Qs.VII)

Assume suitable data & necessary neat diagrams wherever required.

Question No		Maximum Marks	Course Outcome Number	Modu Numb
Qs. I	a. State the main objectives of reactive power compensation in terms of Load compensation and Voltage support.	10	1	1
	b. "A star connected unbalanced 3- Φ complex linear load supplied with a balanced 3- Φ source, can be treated as a balanced load by using passive elements" Justify the statement using relevant equivalent circuit and phasor diagrams.	10	1	1
Qs. II	Explain the following:			
	a. Synchronous link Converter Var Compensator	10	3	2
	b. Pulse Width Modulation techniques.	10	3	2
Qs. III	a. With neat circuit diagrams, compare the V-I characteristics of the following shunt compensators connected to a power system bus. (i) Thyristor Switched Reactor & Thyristor Controlled Reactor.	10	2	3
	(ii) Thyristor Switched Capacitor & FC-TCR.	10	2	3
	b. Name the shunt compensator based on voltage source converter (VSC) and explain how is it used to exchange real and reactive power with the power system bus to which it is connected. Support your answer with neat equivalent circuit and phasor diagrams.			

Qs. IV	<p>a. Suggest the methods to control the operation of a Thyristor Controlled Series Capacitor (TCSC) to achieve the following conditions. Justify your answer using the basic equivalent impedance equation of TCSC, neglecting the losses.</p> <p>(i) To operate in Fixed capacitor mode.</p> <p>(ii) To operate in inductive mode</p> <p>(iii) To increase the observed capacitance of the TCSC without a large capacitance with the TCSC</p> <p>b. Show the effect of SSSC and SVC on power-angle ($p-\delta$) curve. Support your answer analytically with relevant equivalent circuit and phasor diagram.</p>	10	2	4
Qs. V	<p>a. Explain the operation of UPFC as power angle regulator (PAR) to control the power flow in a power system. Support the answer using relevant equivalent circuit and phasor diagram and characteristics.</p> <p>b. State and explain the functions of the components in an HVDC converter station with a neat diagram.</p>	10	3	4
Qs. VI	<p>Explain the following:</p> <p>a. Effect of source inductance in the operation of a six pulse converter.</p> <p>b. Valve blocking and By-passing in a converter bridge.</p>	10	3	6
Qs. VII	<p>a. Explain the control characteristic of a simple HVDC system with Voltage Dependent Current Order Limit control.</p> <p>b. Explain the operation of an HVDC system based on Voltage Source Converter (VSC) technology built with IGBT's.</p>	10	3	7

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 Examination: RE-EXAMINATION
 Academic Year 2017 -18

Q. P. Code:

Max. Marks: 100

Duration: 03 Hrs

Class: BTech (Electrical)

Semester: VIII

Program: UG

Name of the Course: POWER ELECTRONICS APPLICATION IN POWER SYSTEM

Course Code BTE427

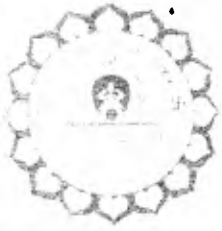
Instructions:

Answer any five questions (Qs.I to Qs.VII)

Assume suitable data & necessary neat diagrams wherever required.

Question No		Maximum Marks	Course Outcome Number	Modu Num
Qs. I	a. What is meant by 'Load Compensation' ? State and explain the objectives of Load Compensation'.	10	1	1
	b. with neat circuit and phasor diagrams, explain load balancing using passive elements for an unbalanced 3- Φ complex linear load.	10	1	1
Qs. II	Explain the following:			
	a. Pulse Width Modulation techniques.	10	3	2
	b. Indirect current controlled Synchronous Link Converter Var Compensator	10	3	2
Qs. III	a. Explain, how are the following shunt compensators connected to a power system support the voltage at the bus as the load varies.	10	2	3
	(i) Thyristor Switched Reactor & Thyristor Controlled Reactor.			
	(ii) Thyristor Switched Capacitor & FC-TCR.			
	b. Explain the principle of operation of STATCOM .	10	2	3

Qs. IV	a. State and explain the different modes of operation of Thyristor Controlled Series Capacitor (TCSC).	10	2	4
	b. Explain the effect of SSSC and Series Capacitor on power-angle ($p-\delta$) curve. Support your answer analytically with relevant equivalent circuit and phasor diagram.	10	3	4
Qs. V	Explain the basic principle & control capabilities of Unified Power Flow Controller (UPFC) with neat Schematic / Single line / phasor diagrams.	20	3	4
Qs. VI	Explain the following: a. Various possible HVDC configurations and their advantages and disadvantages.	10	1	5
	b. Equivalent circuit of a 6-pulse converter considering the effect of source inductance	10	2	6
Qs. VII	Explain the following: a. Power flow reversal in HVDC system	10	3	7
	b. Mode stabilization & Voltage Dependent Current Order Limit	10	3	7



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RE-EXAMINATION JUNE 2018

Program: Electrical Engg.

Duration: 3 hr.

Maximum Marks: 00

Name of the Course: **ELECTRICAL DRIVES AND CONTROL**

Date: JUNE 2018

Course code: BTE426

Semester: VIII

Instructions:

- Solve any 5 questions
- Assume suitable data if necessary give justifications for the same

Question No.	Question	Max points
Q1)	a) What are the functions of converter employed in different electric drives. Explain any three in detail.	10
	b) What are the main factors which decides the choice of electric drive for given application?	10
Q2)	a) Explain the multi quadrant operation of electric drives. Elaborate the necessary sign conventions for the speed and torque.	10
	b) What do you understand by load equalization? Derive an expression for the equivalent moment of inertia for the flywheel required.	10
Q3)	a) List out the different classes of motor duty. Also explain them in detail along with necessary torque and heat curve.	10
	b) Constant speed drive has following duty cycle. 1) Load rising from 0 to 400 kW for 5 min 2) Uniform load of 500 kW for 5 min 3) Regenerative power of 400kW returned to supply for 4 min 4) Remains idle for 2 min Estimate the power rating of the motor. Assume losses proportional to square of power.	10
Q4)	a) Explain the stator voltage control method for controlling the speed of 3 phase induction motor. Draw the associated waveforms.	10
	b) Explain in detail the single phase fully controlled DC motor drive. Also elaborate the discontinues conduction in the same.	10
Q5)	a) Draw the per phase stator referred equivalent circuit of an induction motor. Derive the relation for rotor cu loss, rotor power and equivalent torque developed.	10

	b)	Explain in detail closed loop PWM speed control of induction motor.	10
Q6)	a)	Draw and explain the block diagram of closed loop speed control of induction motor using V/f control method.	10
	b)	What do you understand by hysteresis control method for controlling speed of induction motor using PWM /voltage source inverter	10
Q7)	a)	Explain the operation of induction motor with unbalanced source voltage.	10
	b)	Discuss the operation of induction motor when subjected to unbalanced rotor impedances. Draw the associated torque speed curve.	10



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End Semester- Examination
May 2018



Max. Marks: 100

Class: **B.Tech.(Electrical)**

Sem.: **VIII**

Name of the Course: **Electrical Drives and Control**

Duration: **03 Hours**

Program: **B.Tech.**

Course Code : **BTE426**

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 is the role of power modulator in Electrical Drive.	05
b)	What are the components of load torque.	05
c)	Stator voltage control is preferred for fan type of load. Justify.	05
d)	What is permanent magnet dc motor (PMDC). What are its advantages and disadvantages?	05
Q.2 a)	The control of DC drive is easy as compared to AC drive. Justify.	10
b)	A 3-phase, 100 KW, 6 pole, 960 rpm wound rotor induction motor drives a load whose torque varies such that a torque of 3000 Nm of 10 sec duration is followed by a torque of 500 Nm of duration long enough to attain the steady state speed. Calculate the moment of inertia of the fly wheel, if motor torque should not exceed twice the rated value. Moment of inertia of the motor is 10 kg-m ² . Motor has linear speed-torque curve in the region of interest.	10
Q.3 a)	Three phase induction motor is fed with variable voltage and variable frequency. Draw the torque speed characteristics of three phase induction motor when motor is fed with: i) V_{rated}, F_{rated} ii) $V_{rated}/2, F_{rated}/2$ iii) $V_{rated}/2, F_{rated}$ Justify your answer.	10
b)	A separately excited DC shunt motor is fed by single phase fully controlled rectifier. Explain the operation of converter for continuous	10

	and discontinuous conduction. Draw the source voltage, source current, load voltage and load current waveforms. Draw the torque speed characteristics for the same.	
Q.4 a)	Discuss the necessity of study of operation of induction motor with unbalanced source voltages. What are the frequency components present in the torque under unbalanced source voltage? Justify it.	12
b)	A 3-ph, 440V, 50Hz, 6-pole, Y-connected induction motor has following parameters, $R_s=0.5 \Omega$, $R_r=0.6 \Omega$, $X_s=X_r=1.0 \Omega$. Stator to rotor turns ratio is 2. If the motor is used for regenerative braking determine: (i) Maximum overhauling torque it can hold and the range of the speed in which it can safely operate. (ii) The speed at which it will hold a load with a load torque of 160 Nm.	08
Q.5 a)	Derive the expression for heating and cooling of Electrical Machine.	12
b)	What are the types of motor duty? Explain any two.	08
b)	A Y-connected squirrel cage induction motor has the following ratings and parameters: 400V, 50Hz, 4-pole, 1370rpm, $R_s=2\Omega$, $R_r=3\Omega$, $X_s=X_r=3.5 \Omega$. Calculate motor breakdown torque for inverter fed induction motor for a frequency of 60Hz as a ratio of its 50Hz.	
Q.6 a)	Draw and explain the block diagram of closed loop control of induction motor using V/F control.	12
b)	Draw the block diagram and explain the hysteresis current control of three phase Induction Motor using voltage source inverter.	08
Q.7a)	Draw the neat diagram and explain the closed loop control of dc drive	10
b)	Derive the expression for the calculation of flywheel mounted on the shaft of motor for load equalization	10