

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTUK, Kakinada)

NAAC Accredited Institute

An ISO 9001:2008, ISO 14001:2004 & OHSAS 18001:2007 Certified Institute.

NH-5, Anakapalle, Visakhapatnam-531002, A.P.

Phone: 08924-221111 / 221122/9963981111, www.diet.edu.in, E-mail: info@diet.edu.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING MICROPROCESSORS AND MICROCONTROLLERS

Academic Year : 2017-2018
Name of the Faculty : B. NEELIMA DEVI
Designation : ASST.PROFESSOR
Department : EEE
Year/Semester : III YEAR– II SEMESTER
Subject : MICROPROCESSORS AND MICROCONTROLLERS

UNIT-1 MICROPROCESSOR ARCHITECTURE

- What is the purpose of READY and TRAP pins in 8085 Microprocessor? [3M]
 - If the stack segment register contains 3000h and stack pointer register contains 8434h, what is the physical address of the top of the stack in 8086 microprocessor? [3M]
 - Specify the size of data, address, memory word and memory capacity of 8086 Microprocessor [3M]
- Discuss in-detail about instruction set of 8086 microprocessor. [4M]
 - What is instruction pipelining? [8M]
- List basic features of 80286 microprocessor.[4M]
 - Discuss about the memory segmentation in 8086 processor. How the identified memory segment is accessed by 8086 microprocessor? and also discuss the advantages.[6 M]
- What is the function of Flag register? Describe about the each flag bit. [4M]
 - Explain 8086 architecture with neat diagram and also explain register organization.[6 M]
- List classification of signals in 8086 microprocessor . Draw the signal configuration of 8086 and explain the purpose of each signal. [6M]
 - List basic features of 80386 microprocessor. [4M]
- Discuss the features of 80486 microprocessor.[4M]
 - Why do we need look-up table? [3M]
 - List any two data manipulation instructions.[4M]
- Discuss how pipelined architecture is implemented in 8086 [8M]
 - Explain Bus interfacing Unit of 8086.
- What are the two functional units of 8086? Explain the architecture of 8086 with neat block diagram [16M]
 - Discuss the similarities and differences between COMPARE and SUBTRACT instructions.[4M]

UNIT-2 MINIMUM AND MAXIMUM MODE OPERATIONS

- Compare the similarities and differences of CALL and RET instructions with PUSH and POP instructions.[3M]
 - What do you mean by masking the interrupt? Explain [4M]
 - What is the use of MN/MX signals in 8086? [4M]

2. (a) How address decoding is done in memory interface? Discuss. [4M]
 (b) Describe with a suitable example, operation of a stack. [4M]
 (c) Describe interrupt structure of 8086 microprocessor in brief. [3M]
3. (a) Write an assembly language program to multiply two 16 bit numbers. [3M]
 (b) What information is conveyed when Qs1 and Qs0 are 01? [4M]
 (c) Write the size of physical memory and virtual memory of 8086 microprocessor. [4M]
4. (a) Differentiate between maximum mode and minimum mode of 8086. [2M]
 (b) Discuss about instruction format and different addressing modes of 8086. [6M]
 (c) Draw the timing diagram of I/O read cycle [2M]
5. (a) Draw the timing diagram for op-code fetch machine cycle and memory read machine cycle. [8M]
 (b) Write a program with a flowchart to multiply two 8-bit numbers. [8M]
 (c) Give two examples for logical and branch instructions of 8086. [5M]
6. (a) Draw and explain timing diagram of memory write operation. [4M]
 (b) What is meant by instruction pipelining? Is it available in 8086? Explain. [4 M]
 (c) Define machine cycle & instruction cycle [3M]
7. (a) Discuss I/O map of 8086 with neat diagram. [5M]
 (b) Explain the process of external synchronization using TEST' [5M]

UNIT-3 ASSEMBLY LANGUAGE PROGRAMMING

1. (a) Write instructions to load hexadecimal numbers 61B4H in register C and 8245H in accumulator. Display the number 61B4H in port0 and 8245H in port1. [4M]
 (b) List various assembler directives of 8086 microprocessor. [6M]
2. (a) Write an ALP in 8051 to count number of positive and negative numbers from an array of 8-bit integers. [4M]
 (b) Compare macros and procedures with suitable examples. [4M]
 (c) What is the difference between Microprocessors and Microcontrollers? [3M]
3. (a) Mention the size of DPTR and Stack Pointer in 8051 microcontroller. [4M]
 (b) List the alternative functions assigned to Port 3 pins of 8051 microcontroller. [2M]
 (c) Write an ALP to find the multiplication of two 16-bit Hex numbers? [4M]
4. (a) What is a MACRO? How do you pass parameters to MACRO's? [5M]
 (b) Give the assembly language implementation of the following: [5M]
 (i) FOR LOOP (ii) REPEAT (iii) IF-THEN-ELSE
5. (a) Write an ALP to find the multiplication of two 16-bit Hex numbers? [5M]
 (b) Write an 8086 Assembler Program that adds two given 4-digit BCD numbers. [5M]
6. (a) Write an 8086 assembler program to decide the parity of a given number. The given number might be a multi-byte with a maximum length of 8 bytes. [5M]
 (b) How is PUSH B instruction executed? Find the status after execution [4M]
 (c) What is the operation of given 8051 microcontroller instructions: XRL A, direct? [1M]

UNIT-4 I/O INTERFACE

1. (a) How data is transmitted in asynchronous serial communication? Make a comparison between parallel and serial type of data transfer. [5M]
 (b) Discuss the process of stepper motor interfacing. [5M]
2. (a) Draw the logical block diagram of 8279 keyboard display controller and explain. [6M]
 (b) What is keyed bouncing? [2M]
 (c) Write advantages of PIC chips in microprocessor based systems. [2M]
3. (a) Explain the architecture and operation of 8257 DMA controller with a neat block diagram. [6M]

- (b) Explain the functions of following signals of 8257 [2M]
 (i) HLDA (ii) AEN (iii) MARK (iv) MEMR
- (c) What are the registers available in 8257? What are their functions? [2M]
4. Explain the cascaded mode operation of 8259 with a neat block diagram. [10M]
5. (a) Discuss basic features of 8259 [2M]
 (b) With neat block diagram explain the functions of 8259 [8M]
6. (a) Discuss the interrupt priority schemes used in 8259. [4M]
 (b) Write about operational command word of 8259. [3M]
 (c) Discuss about the initialization command words of 8259 and their sequence in detail. [4M]
7. (a) List the operating modes of 8255A PPI? Write the input/output feature in Mode 0 for the 8255A PPI? [4M]
 (b) Explain the main features of 8255. [3M]
 (c) Draw block diagram of 8255 and explain its modes of operation. [4M]
8. (a) Show the control word format of 8255 and explain how each bit is programmed? [5M]
 (b) Interface D to A converter DAC 0800 with 8086 running at 8 MHz and write an ALP to generate a triangular wave of 1kHz frequency with V_{max} of 5V. [5M]

UNIT-5 INTRODUCTION TO 8051 MICROCONTROLLER

1. (a) Draw the pin Diagram of 8051 and explain the function of various signals. [7M]
 (b) Write an 8051 ALP to find Fibonacci series of N numbers. [3M]
2. (a) Write an 8051 ALP to find the average of N numbers. [3M]
 (b) Explain instruction set of 8051 [7M]
3. (a) What is the importance of special function registers (SPF) in 8051? [4M]
 (b) What are the features of 8051 microcontroller? [3M]
 (c) What is the advantage of microcontroller over microprocessor? [4M]
4. (a) Write a program based on 8051 instruction set to pack array of unpacked BCD digits. [4M]
 (b) Explain the data types and assembler directives of 8051. [4M]
 (c) List the on-chip peripherals of 8051 microcontroller. [2M]
5. (a) Explain the different addressing modes of 8051. [6M]
 (b) Explain the architecture of 8051 with its diagram. [6M]
6. (a) Explain the modes of operation of Timer unit in 8051 Microcontroller. [3 M]
 (b) Draw and explain the flag register of 8051 microcontroller. [3M]
 (c) Discuss the internal memory organization of 8051 microcontroller. [4M]

UNIT-6 CYBER PHYSICAL SYSTEMS AND INDUSTRIAL APPLICATIONS OF 8051

1. (a) Explain the applications of microcontrollers. [2 M]
 (b) How much current is needed to drive an LED? Explain interfacing of 8051 μC with LED's. [8M]
2. (a) Explain the keyboard interfacing using 8051. [7M]
 or
 Interface an 8×8 keyboard using 8255 ports and write a program to read the code of pressed key
 or
 How do you interface a 4 × 4 matrix keyboard using 8051 microcontroller?
 (b) What do you mean by quantization noise? [3M]
3. (a) Explain interfacing of Seven Segment display with 8051 micro controller. [6M]
 (b) Explain how interrupts are handled in 8051. [4M]
4. (a) Name any two types of A to D converters. Draw and explain the ADC interfacing using 8051 [8 M]

- (b)What is the difference between A/D and D/A converters? [2M]
5. (a)Draw and explain the DAC interfacing using 8051. [5M]
(b)Quantify the number of register banks in 8051 and say how CPU knows which bank is currently in use.[2M]
(c)What do you understand by bit addressable RAM in 8051 microcontroller? [3M]
6. Explain different methods of memory address decoding in 8051 microcontroller. [5M]
7. Why do we need opto-isolator circuit between microcontroller and the stepper motor? [5M]



DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTUK, Kakinada)

An ISO 9001:2008, ISO 14001:2004 & OHSAS 18001:2007 Certified Institute.

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, www.diet.edu.in, E-mail: info@diet.edu.in

Department of Electronics and Communication Engineering

IV B.Tech (CSE) Sem-II QUESTION BANK

Subject: **Management Science (R13)**

Faculty: **A. Kiran Kumar, Sr. Asst. Professor, MBA Department**

I UNIT

1. a) What is the significance of Hawthorne experiments for management?
b) Define Management and explain its functions.
2. a) Define Management? Explain Henry Fayol's principles of management
b) Differentiate between behavioral approach and scientific approach to management.
3. a) Explain the nature of management.
b) What are the challenges you have to face as a manager.
4. a) Describe the theory of scientific management and explain how it was criticized.
b) What is matrix organization and what is its uniqueness.
5. a) Why is management considered as a profession and what factors make it a profession?
b) Distinguish between Theory – X and Theory – Y
6. a) What is motivation? Explain Abraham Maslow's needs Hierarchy theory.
b) What do you mean by Functional organization structure? What are the advantages and disadvantages?

II UNIT

1. a) Describe the basic procedure to be followed in adopting work study techniques for Sound results
b) What is inventory? Explain the need for inventory control
2. a) What do you mean by EOQ? derive the formula for determining the EOQ.
b) Define control charts and explain its types
3. a) What is meant by materials management? state its advantages and disadvantages.
b) Explain the types of ABC analysis.
4. a) What is meant by integrated Materials Management? State its advantages
b) Discuss about various types of p chart, r chart.
5. What is statistical quality control? How is this important in operations management

III UNIT

1. a) State the importance and methods of job evaluation.
b) Define training and explain its methods.
2. a) What do you understand by marketing mix?
b) Explain briefly the basic elements in marketing mix
3. a) Explain the functions of personnel management
b) Evaluate the different sources of recruitment
4. a) What do you understand by Human Resource Management?
b) Define Human Resource Development? Outline its concept.
5. a) Define Human Resource Management. Explain its functions
b) What are the differences between Human Resource Management and Personal Management and Industrial Relations?
6. a) Discuss in brief about various wage payment plans? Are they relevant in present day Context.
b) What is product life cycle? Describe its stages.

IV UNIT

1. From the following information:
 - a) Draw the project network and find critical path.
 - b) Calculate earliest starting times and earliest finished times for each activity.
 - c) Determine Total, Free and Independent floats.

Activity	Immediate Predecessor	Duration
A	-	3
B	-	4
C	A	5
D	A	7
E	B,C	3
F	B,C,D	6

2. From the following information:
 - a) Draw the network
 - b) Find its critical path and project duration

c) Determine Total, Free and Independent Floats.

Activity	Duration
1-2	5
1-3	4
2-4	6
3-4	2
4-5	1
4-6	7
5-7	8
6-7	4
7-8	3

3. From the following data crash the network and identify the optimum time of the project where the indirect cost is estimated Rs. 60 per day.

Activity	normal time	Crash time	Cost slope
1-2	9	6	20
1-3	8	5	25
1-4	15	10	30
2-4	5	3	10
3-4	11	6	15
4-5	2	1	40

4. From the following information:

- Draw the PERT network
- Find variance for each activity
- Find variance and standard distribution for critical path
- What is the probability that the project will be completed in 23 days?
- Find Total, Independent and Free floats?

Activity	To	Tm	Tp
1-2	3	3	3
2-3	3	6	9
2-4	2	4	6
3-5	4	6	8
4-6	4	6	8
5-6	0	0	0
5-7	3	4	5
6-7	2	5	8

- What is CPM? Discuss its advantages and limitations.
 - Distinguish between PERT and CPM.

6. a) What is PERT? State its advantages and limitations
- b) What is CPM? Explain its advantages.

V UNIT

1. (a) How do you formulate and implement strategy? Explain
- (b) What is the need for corporate planning process?
2. (a) **what are the factors of external and internal environmental to be considered for formulating the strategy? Explain.**
- (b). Explain various generic strategy alternatives in detail
3. (a) **Define strategic management and describe the process of strategic management.**
- (b) **How do you carry out SWOT analysis for a manufacturing unit?**
4. (a) What do you understand by the concept of strategy? Discuss the concept of Mission and Vision.
- (b). **Discuss corporate planning process.**
5. (a). Explain various external environment scanning techniques used by the organization
- (b) What is environmental scanning? How is this important in present day context.

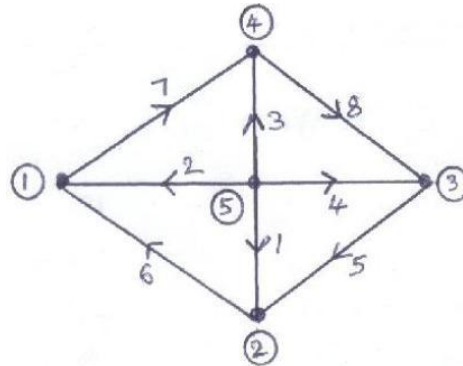
VI UNIT

1. Write a notes on:
 - (a) **Capability Maturity Model**
 - (b) Balanced Score card.
2. Write a notes on :
 - (a) Supply Chain Management
 - b) Performance Management.
- 3 (a) What is Enterprise Resource Planning? Explain
- (b) Explain the merits and demerits of Enterprise Resource Planning.
4. (a) define total quality management and explain its significance.
- (b) Write notes on six sigma
5. **Write a short notes on:**
 - (a) **Management Information System**
 - (b) **Bench Marking.**
6. **Discuss the following;**
 - a) **Supply Chain Management**
 - b) **Enterprise Resource Planning**

SUB: Power System Analysis Name of the Faculty: R.V.S.Lakshmi Kumari 3rd EEE A & B

UNIT – 1

1. a) Find the bus incidence matrix for the following network?

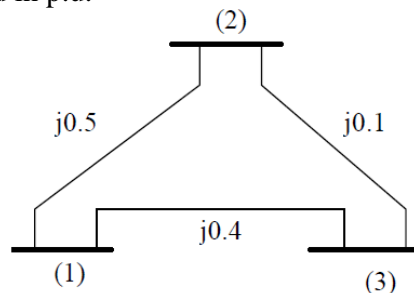


b) Derive the Bus admittance matrix by singular transformation?

2. a) Determine the following terms with suitable examples.

i) Graph ii) Tree iii) Co-Tree iv) Cut-set matrix v) Basic cut-set

b) For the system shown below, Obtain Y_{bus} by direct inspection method. Take bus (1) as reference. The element impedances are indicated in p.u.



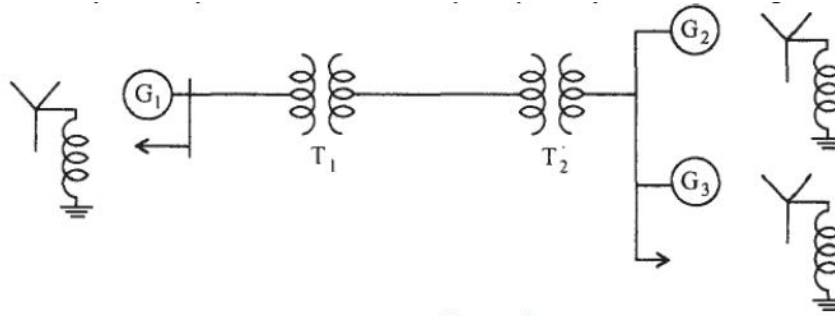
3. a) What is Reduced incidence matrix? Explain with an example. [4M]

b) Find Y-bus for a network with following data by direct inspection method.

Line impedance and line charging data:

Line (bus to bus)	Impedance	Line charging (Y/2)
1-2	$0.02 + j 0.1$	$j 0.03$
1-5	$0.05 + j 0.25$	$j 0.02$
2-3	$0.04 + j 0.2$	$j 0.025$
2-5	$0.05 + j 0.25$	$j 0.02$
3-4	$0.05 + j 0.25$	$j 0.02$
3-5	$0.08 + j 0.4$	$j 0.01$
4-5	$0.10 + j 0.5$	$j 0.075$

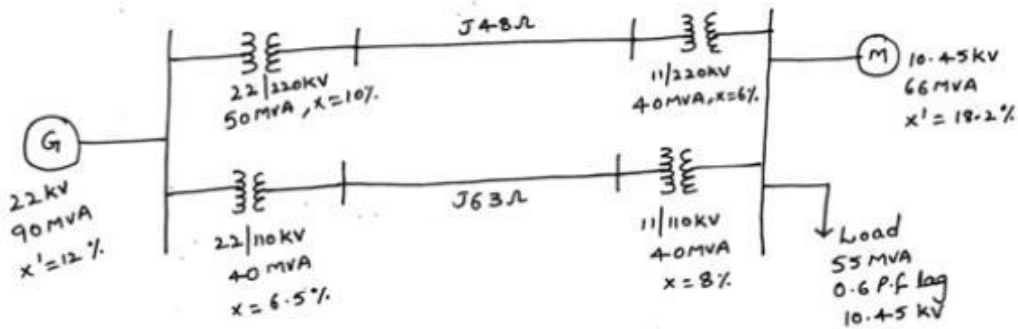
4. Obtain the per unit representation for the three-phase power system shown in figure 1
Figure



Generator 1 : 50 MVA; 10.5 KV; $X = 1.8$ ohm
 Generator 2 : 25 MVA; 6.6 KV; $X = 1.2$ ohm
 Generator 3 : 35 MVA; 6.6 KV; $X = 0.6$ ohm
 Transformer T1 : 30 MVA; 11/66 KV; $X = 15$ ohm/phase
 Transformer T2 : 25 MVA; 66/6.2 KV, as h.v. side $X = 12$ ohms
 Transmission line: $X_L = 20$ ohm/phase

5.

Draw the P.u impedance diagram for the power system shown in the figure below.



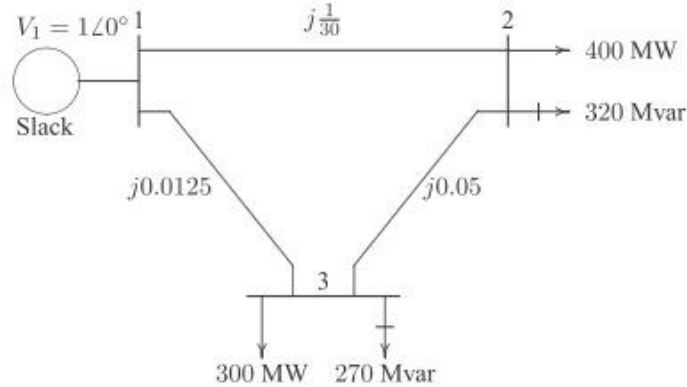
4.

UNIT - 2

1. a) Draw the flowchart for load flow solution by Gauss-Seidel iterative method using Ybus
 b) Write the advantages of Newton-Raphson method?
 c) What are the assumptions of static load flow equations?
2. a) Develop load flow equations suitable for solution by Newton Raphson method using rectangular when only PQ buses are present.
 b) Discuss the advantage of using Ybus model in of power system network for load flow analysis.
3. a) Derive the basic equations for the load flow study using Gauss-Seidel method. With respect to this method, explain the following:

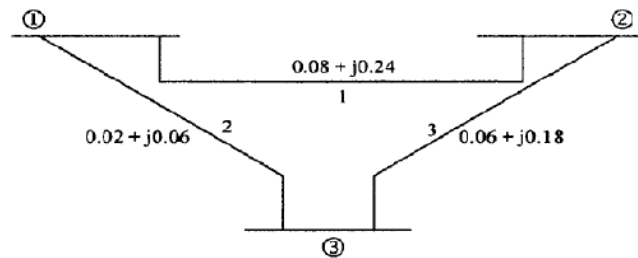
- i) Acceleration factor.
 - ii) Handling of PV buses.
- b) What is Jacobian matrix? How the elements of Jacobian matrix are computed?

4. In fig shows the one-line diagram of a simple three-bus power system with generation at bus 1 is $V = 1.0 + j0$ per unit. The scheduled loads on buses 2 and 3 are marked on the diagram. Line impedances are marked in per unit on a 100 MVA base. For the purpose of hand calculations, line resistances and line charging susceptance are neglected. Using gauss-Seidel method and initial estimates of $V_2 = 1.0 + j0$ and $V_3 = 1.0 + j0$, determine V_2 and V_3 . Perform two iterations.

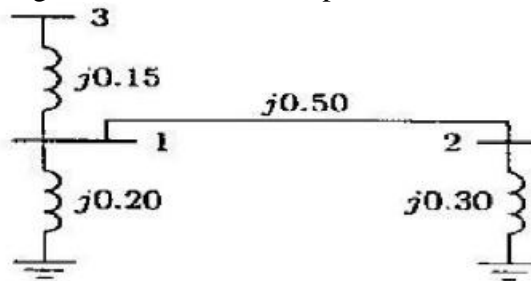


UNIT - 3

- 1. a) Describe the procedure of modification of Zbus by adding mutually coupled branch from any two existing buses.
- b) For the 3-bus system shown in the figure, Obtain Zbus?



- 2. a) Using the method of building algorithm find the bus impedance matrix for the network shown in the figure.



- b) What is primitive network, primitive impedance matrix and primitive admittance matrix.
- 3. a) Derive an expression for adding a branch element between two buses in the ZBUS building algorithm.
 - b) Write the merits and demerits of ZBUS building algorithm.
- 4. Derive the necessary expressions for the building up of ZBUS when i) New element is added ii) New Element is added between two existing buses
Assume mutual coupling between the added element and the elements in the partial network.

5.

a) Form bus impedance matrix for the data given below.

Element number	Bus code From bus – To bus	Self impedance
1	2-3	0.6 p.u.
2	1-3	0.5 p.u.
3	1-2	0.4 p.u.

b) Explain the procedure for modification of Z_{bus} when a line is added or removed which has no mutual reactance.

UNIT – 4

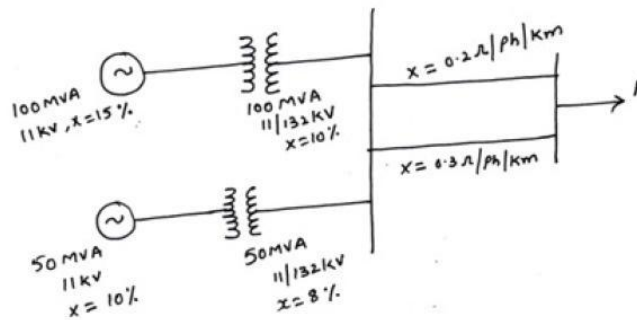
1. a) For a three phase symmetrical fault on a balanced power system using matrix notation, derive the expression for i) current ii) current at any other bus iii) Voltage at any bus excluding the faulted bus.

b) Write a short note on the assumptions made in short circuit studies?

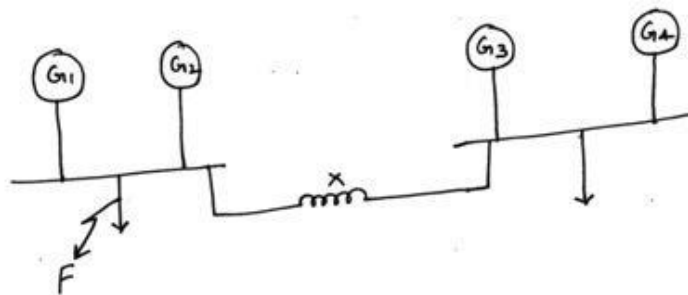
2. a) There are two generating stations each which an estimated short circuit KVA of 500,000 KVA and 600,000 KVA. Power is generated at 11 KV. If these two stations are interconnected through a reactor with a reactance of 0.4 ohm, what will be the short circuit KVA at each station?

b) What do you understand by short-circuit KVA? Explain.

3. The following figure shows a generating station feeding a 132 kV system. Determine the total fault current fault level and fault current supplied by each alternator for a 3- phase fault at the receiving end bus. The line is 250 kM long.

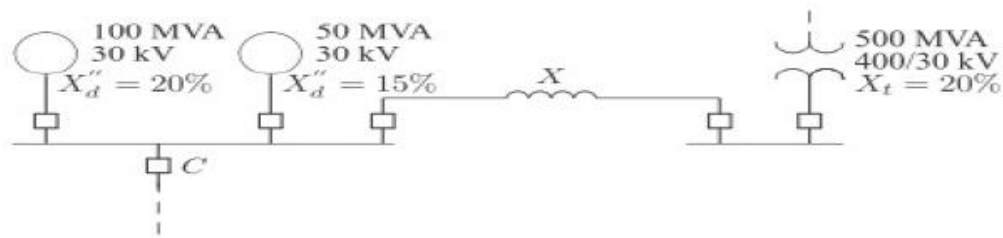


4. Figure shows a system having 4 alternators each rated at 11 kV, 50 MVA and each having a subtransient reactance of 15%. Find a) fault level for a fault on one of the feeders(near the bus) with zero value of reactance X (b) the reactance of the current limiting reactor X to limit the fault level to 800 MVA for a fault on one of the feeder(near the bus).



5. The system shown in Fig below shows an existing plant consisting of a generator of 100 MVA, 30 KV, with 20 percent sub transient reactance and a generator of 50 MVA, 30 KV with 15 percent reactance, connected in parallel to a 30-KV bus bar. The 30-KV bus bar feeds a transmission line via the circuit breaker C which is related at 1250 MVA. A grid supply is connected to the substation bus bar through a 500 MVA, 400/30KV transformer with 20 percent reactance. Determine the reactance of a current limiting reactor in

ohm to be connected between the grid system and the existing bus bar such that the short-circuit MVA of the breaker C does not exceed.



UNIT – 5

1. a) Derive the necessary equations to determine the fault current for a double line to ground fault. Draw a diagram showing inter connection sequence networks.
b) What are the advantages of symmetrical components?
2. a) Derive an expression for fault current in Line to ground fault. Also draw sequence network connections.
b) Determine the symmetrical components for the three phase currents.
 $I_R = 15\angle 0^\circ$, $I_Y = 15\angle 230^\circ$ and $I_B = 15\angle 130^\circ$ A
3. a) Prove that neutral current can flow only if zero sequence currents are present.
b) Draw the sequence network connections for single-line to ground, double line fault and double-line to ground fault conditions.
4. a) Prove that a line to ground fault at the terminals for an alternator with solidly grounded neutral is more severe than a three phase fault.
b) Explain the zero sequence networks of transformers with diagrams.
5. Two 11kV, 20 MVA, 3f, star connected generators operates in parallel. The positive, negative and zero sequence reactance of each being respectively, $j 0.18$, $j 0.15$, $j 0.1$ p.u. The star point of one the generator is isolated and that of the other is earthed through a 2_Ω resistor. A single line to ground fault occurs at the terminals of one of the generator. Determine i) fault current ii) current in ground resistor and iii) voltage across grounding resistor.

UNIT – 6

1. a) Derive the swing equation of single machine connected to infinite bus and also write the assumptions to derive it.
b) Explain the terms i) Transient stability ii) Dynamic stability and iii) Steady State Stability
2. a) A 200 MVA, 2 pole, 50 Hz alternator has a moment of inertia of 50000 Kg-m². What is the energy stored in the rotor at the rated speed? Find the value of H and determine the corresponding angular momentum.
b) Define synchronizing power coefficient? What is its significance?
c) What is the significance of 'swing curve'?
3. a) Derive the swing equation for a single machine connected to infinite bus system. State the assumptions if any and state the usefulness of this equation. Neglect the damping.
b) Discuss the various factors affecting the transient stability of the system.
4. a) Explain critical clearing time and critical clearing angle, deriving the expressions.
b) Describe the methods of improving transient stability.
5. Draw a diagram to illustrate the application of equal area criterion to study Transient stability when there is a sudden increase in the input of generator.

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTU, Kakinada)

NAAC Accredited Institute

An ISO 9001:2008; ISO 14001:2004 & OHSAS 18001:2007 Certified Institution

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, e-mail: info@diat.edu.in

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

QUESTION BANK(2017-18)

POWER SEMICONDUCTOR DRIVES

Name of the faculty : P. JAGRUTHI

REGULATION: R13

COURSE : B.TECH

BRANCH: EEE

YEAR / SEMESTER : III/ II

UNIT – I

- 1 a) Explain the different components of basic electrical drive system. [5M]
b) Describe different braking methods employed for electrical motors. [5M]
- 2 a) What are the main factors which decide the choice of electrical drive for a given application? [5M]
b) Explain in detail about components of load torques. [5M]
- 3 a) Explain the four quadrant operation of a motor drive in general. [5M]
b) Describe different braking methods employed for D.C. motors. [5M]
- 4 a) What are advantages of electrical drive? [5M]
b) Explain about fundamental torque equation. [5M]
- 5 a) What do you mean by regenerative braking of motor? Explain. [5M]
b) Explain about nature and classification of different load torques. [5M]
- 6 a) Explain the different components of basic electrical drive system. [5M]
b) Explain the four quadrant operation of a motor drive in general. [5M]

UNIT – 2

- 1 a) Describe the flux control method of series motor. [5M]
b) Explain the first quadrant chopper controlled separately excited dc motor. [5M]
- 2 a) Explain the operation of a separately excited dc motor supplied from 3-phase fully controlled rectifier with necessary diagrams. Assume Continuous conduction. [5M]

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTU, Kakinada)

NAAC Accredited Institute

An ISO 9001:2008; ISO 14001:2004 & OHSAS 18001:2007 Certified Institution

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, e-mail: info@diat.edu.in

- b) A 220V, 1440rpm, 120A separately excited DC motor with armature resistance of 0.7 ohms is fed from 3-phase fully controlled converter with an ac source line voltage 440V, 50 Hz supply. A star connected transformer is used to feed the armature so that motor terminal voltage equals rated voltage when converter firing angle is zero. Calculate the value of firing angle when motor is running at 1200 rpm at rated torque. [5M]
- 3 a) Briefly explain different speed control techniques for D.C. motor. [5M]
b) Discuss the drawbacks of rectifier control of dc series motor. [5M]
- 4 a) Explain the operation of 3-phase six pulse converter feeding DC series motor with neat diagram and relevant waveforms. [5M]
b) A 200V, 875rpm, 150A separately excited dc motor has an armature resistance of 0.06ohm. It is fed from a three phase fully controlled rectifier with an ac source of 220V, 50Hz. Assuming continuous conduction, calculate (i) Firing angle for rated motor torque and 750rpm.
(ii) Motor speed for $\alpha = 160^\circ$ and rated torque. [5M]
- 5 a) Explain the operation of dual converter controlling the separately excited dc motor. [5M]
b) A 220 V, 1500 rpm, 11.6 A separately excited motor is controlled by a 3-phase fully controlled rectifier with an ac source voltage of 230 V, 50 Hz. Enough filter inductance is added to ensure continuous conduction for any torque greater than 25 percent of rated torque, $R_a = 2$ ohms.
(i) What should be the value of the firing angle to get the rated torque at 1000 rpm?
(ii) Calculate the firing angle for the rated braking torque and 1500 rpm.
(iii) Calculate the motor speed at the rated torque and $\alpha = 160^\circ$ for the regenerative braking in the second quadrant.
- 6 a) Explain the operation of a separately excited dc motor supplied from 3-phase semi controlled rectifier. [5M]
b) A 12.2 kW, 230 V, 850 rpm, 56 A dc separately excited motor is controlled by a 3-phase fully-controlled rectifier fed from 460 V, 60 Hz ac supply through a transformer. It has an armature resistance of 0.284 ohms and sufficient inductance to assure continuous conduction for all operating points with torques greater than 20 percent of the rated. The transformer and the source impedance can be neglected.
(i) A rated dc voltage across the motor at full load is desired. Choose a suitable transformer from the following three available:
(a) 460/460 V (b) 460/230 V (c) 460/ 180 V Having chosen the transformer find the following:
(i) The rectifier firing angle for the rated torque and speed. [5M]
(ii) The rectifier firing angle for the rated braking torque and the speed of 600 rpm in the reverse direction. [5M]

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTU, Kakinada)

NAAC Accredited Institute

An ISO 9001:2008; ISO 14001:2004 & OHSAS 18001:2007 Certified Institution

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, e-mail: info@diet.edu.in

UNIT- 3

- 1 a) Explain the first quadrant chopper controlled separately excited dc motor. [5M]
b) Describe the first quadrant chopper control of dc series motor. [5M]
- 2 a) Explain the operation of a four quadrant chopper fed to the D.C series motor and also draw the current and voltage wave forms for continuous current operation.[5M]
b) A 220v, 24A, 1000rpm separately excited dc motor having an armature resistance of 2 ohms is controlled by a chopper. The chopping frequency is 500Hz and the input voltage is 230V. Calculate the duty ratio for a motor torque of 1.2 times rated torque at 500rpm. [5M]
- 3 a) Explain with circuit and waveforms of four quadrant chopper fed separately excited DC motor.[5M]
b) A 230V, 960rpm and 200A separately excited dc motor has an armature resistance of 0.02ohms. The motor is fed from a chopper, which is capable of providing both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction: When motor is operated in Dynamic braking, with Braking resistance of 2 ohm
(i) calculate Duty ratio of chopper for a motor speed of 600 rpm and braking torque of twice the rated value.
(ii) What will be the motor speed for a duty ratio of 0.6 and motor torque equal to twice its rated value? [5M]
- 4a) List the advantages offered by dc chopper drives over line-commutated converter controlled dc drives. [5M]
b) Draw the block diagram of closed loop operation of chopper controlled dc motor. [5M]
- 5 a) Explain with circuit and waveforms of two quadrant chopper fed separately excited DC motor.[5M]
b) A 230V, 960 rpm and 200A separately excited dc motor has $R_a=0.02\text{ohm}$. The motor is fed from a chopper which provides both motoring and braking operations. Assume continuous conduction. Calculate duty ratio of chopper for motoring and braking operations at rated torque and 350 rpm[5M]
- 6 a) With circuit and waveforms explain the operation of four quadrant chopper fed separately excited DC motor.[5M]
b) A 230 V, 500 rpm, 90 A separately excited dc motor having an armature resistance and inductance 0.115 ohms and 11 mH respectively, is controlled by a class C twoquadrant chopper operating with a source voltage of 230 V and a frequency of 400 Hz.
(i) Calculate the motor speed for a motoring operation at $\delta = 0.5$ and half of rated torque.
(ii) What will be the motor speed when regenerating at $\delta = 0.5$ and rated torque? [5M]

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTU, Kakinada)

NAAC Accredited Institute

An ISO 9001:2008; ISO 14001:2004 & OHSAS 18001:2007 Certified Institution

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, e-mail: info@diat.edu.in

UNIT- 4

- 1a) Draw the block diagram of closed loop operation of induction motor drives. [5M]
- b) Why V/f ratio must be constant for a frequency controlled induction motor drive? Explain. [5M]

- 2 a) Discuss speed control of induction motor from stator side with speed-torque curves. [5M]

- b) The parameters of a three phase 400 Volts, 50 Hz, 6 pole, 960 rpm, and star connected induction motor has the following parameters per phase referred to the stator. $R_1 = 0.4 \text{ Ohm}$, $R_2 = 0.20 \text{ Ohm}$, $X_1 = X_2 = 1.5 \text{ Ohm}$, $X_m = 30 \text{ Ohms}$. If the motor is controlled by variable frequency control at a constant flux of rated value, determine the motor speed and the stator current at half the rated torque and 25Hz. [5M]

- 3 a) Explain why stator voltage control is suitable for speed control of Induction motors in fan and pump drives. Draw and explain speed control of 3 phase Induction motor using AC Voltage Controller

- b) The rotor resistance and stand still reactance referred to stator of a 3 phase, 4 pole, 50 Hz Squirrel cage Induction motor is 0.2 ohm and 0.8 ohm per phase respectively. The full load slip of the motor is 4 percent. Neglect stator resistance and leakage reactance. Determine how much stator voltage should be reduced in order to get a speed of 1200 rpm if the load torque remains constant. [5M]

- 4 a) Draw the speed-torque characteristics of induction motor with variable frequency control. [5M]
- b) Explain the significance of (V/f) speed control method of an induction motor. [5M]

- 5 a) Show that variable frequency control of induction motor is more efficient than stator voltage control.

- b) A 440V, 3 phase, 50 Hz, 6 pole, 945 rpm, delta connected Induction Motor has the following parameters referred to the stator. $R_s = 2 \text{ ohms}$, $R_r = 2 \text{ ohms}$, $X_s = 3 \text{ ohms}$, $X_r = 4 \text{ ohms}$. When driving a fan load at rated voltage it runs at rated speed. The motor speed is controlled by stator voltage control. Determine motor terminal voltage, current and torque at 800 RPM. [5M]

- 6 a) Explain speed control of induction motor by AC Voltage Controllers. [5M]

- b) A 3 phase, 4 pole, 50 Hz squirrel cage Induction motor has the following circuit parameters:
 $r_1 = 0.05 \text{ ohm}$, $r_2 = 0.09 \text{ ohm}$, $X_1 + X_2 = 0.55 \text{ ohm}$.
The motor is star connected and rated voltage is 400V. It drives a load whose torque is proportional to the speed and is given as $T_1 = 0.05 \omega \text{ N-m}$. Determine the speed and torque of the motor for a firing angle of 45° of the AC Voltage Controller on a 400V, 50 Hz supply [5M]

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTU, Kakinada)

NAAC Accredited Institute

An ISO 9001:2008; ISO 14001:2004 & OHSAS 18001:2007 Certified Institution

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, e-mail: info@diat.edu.in

UNIT – 5

- 1 a) Define Slip power and its significance. [5M]
b) Draw and explain the equivalent circuit of a wound rotor induction motor when voltage is injected in the rotor circuit. [5M]
- 2 a) Draw the circuit diagram and explain the operation of rotor- resistance control of Induction motor. Mention the advantages and disadvantages of the above method of control. [5M]
b) Explain Static Kramer drive for a three phase induction motor. [5M]
- 3 a) Why rotor resistance control is preferred in low power crane drives? [5M]
b) Draw the circuit diagram for static Scherbius drive [5M]
- 4 a) Explain static Scherbius drive control for speed control of induction motor. Draw speed -torque characteristics. [5M]
b) Explain with circuit & waveforms for speed control of induction motor by Static rotor resistance.
- 5 a) Draw the circuit diagram and explain the working of a slip power recovery system using Static Kramer drive for a three phase induction motor. [5M]
b) Explain with circuit and waveforms for speed control of induction motor by Static rotor resistance method. [5M]
- 6 a) Draw and explain the equivalent circuit of a wound rotor induction motor when voltage is injected in the rotor circuit. [5M]
b) Draw the circuit diagram and explain the working of a slip power recovery system using Static Kramer drive for a three phase induction motor. [5M]

UNIT – 6

- 1 a) When operating in true synchronous mode, why the frequency must be changed in small steps? [5M]
b) Compare self-controlled and load-commutated inverter controlled synchronous motor drives. [5M]
- 2 a) Describe self-controlled and load-commutated inverter controlled synchronous motor drives in detail. [5M]
b) Draw the block diagram of a closed loop synchronous motor drive fed from VSI. [5M]

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTU, Kakinada)

NAAC Accredited Institute

An ISO 9001:2008; ISO 14001:2004 & OHSAS 18001:2007 Certified Institution

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, e-mail: info@diat.edu.in

- 3 a) Explain the operation of Load commutated CSI fed Synchronous motor drive. [5M]
b) In variable frequency control of a synchronous motor why (V/f) ratio is maintained constant up to base speed and V constant above the base speed. Explain briefly with necessary waveforms. [5M]

- 4 a) What is the basic difference between true synchronous mode and self control mode for variable frequency control of Synchronous motor? [5M]
b) Compare self-controlled and load-commutated inverter controlled synchronous motor drives.

- 5 a) Describe the operation of self-controlled Synchronous Motor drives in detail. [5M]
b) Describe the open-loop and closed loop methods of speed control of a synchronous motor using VSI. [5M]

- 6 a) How is the output voltage of a VSI improved by PWM techniques? Explain how you will use this Converter for speed control of a synchronous motor. [5M]
b) Discuss in detail with suitable circuit diagram the principle of operation of self controlled Synchronous motor drive employing load commutated thyristor inverter. [5M]

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTU, Kakinada)

NAAC Accredited Institute

An ISO 9001:2008; ISO 14001:2004 & OHSAS 18001:2007 Certified Institution

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, e-mail: info@diet.edu.in

Department of Electrical & Electronics Engineering

LECTURE PLAN (Academic Year 2017-18)

SWITCHGEAR & PROTECTION

D.Poojitha, Assistant Professor

III Year B.Tech – II Semester

Branch: EEE

UNIT I: CIRCUIT BREAKERS - I

S.No.	Topic covered	No. of Classes required	Reference Book	Chapter
1	Elementary Principle of arc Interruption	2	Badri Ram	9.1
2	Methods of arc Interruption	2	Badri Ram	9.2
3	Recovery & Restriking Voltages	1	Badri Ram	9.3
4	Restriking Phenomena, Average & Max RRRV	1	Badri Ram	9.3
5	Current Chopping	1	Badri Ram	9.5
6	Resistance switching	1	Badri Ram	9.4
7	CB Ratings & specifications	1	Badri Ram	9.16
8	Auto-reclosures & Problems	1	Badri Ram	4.24
9	Classification of Circuit Breakers	1	Badri Ram	9.7
10	Bulk oil Circuit Breakers	1	Badri Ram	9.8
11	Minimum Oil circuit Breakers	1	Badri Ram	9.8
12	Advantages & disadvantages of MOCB	1	Badri Ram	9.8
13	Air Circuit Breaker	1	Badri Ram	9.10
14	Air blast circuit breaker, advantages & disadvantages	1	Badri Ram	9.9
15	SF ₆ circuit breaker, advantages & disadvantages	1	Badri Ram	9.11

16	Vacuum circuit breaker, advantages & disadvantages	1	Badri Ram	9.12
	TOTAL	18		

UNIT-II: Electromagnetic Protection

S.No	Topic covered	No. Of Classes required	Reference Book	Chapter
1	Introduction of relays	1	Badri Ram	1.10
2	Principle of operation & construction of attracted armature type relays	1	Badri Ram	2.1
3	Plunger Relay, Balanced beam Relay	1	Badri Ram	2.1
4	Induction Disc & Induction cup Relay	1	Badri Ram	2.1
5	Relays classification, Instantaneous & IDMT relays	1	Badri Ram	3.4
6	Over current & under-voltage relays	2	Badri Ram	3.4
7	Directional & Differential Relays	1	Badri Ram & C L Wadhwa	3.11 & 14.8
8	Percentage Differential relay	1	C L Wadhwa	14.8
9	Universal torque equation, Distance relays	1	C L Wadhwa	14.7
10	Impedance, Reactance & Mho Relays & their characteristics	2	C L Wadhwa	14.10
	TOTAL	12		

UNIT-III: GENERATOR & TRANSFORMER PROTECTION

S.No.	Topic covered	No. Of Classes required	Reference Book	Chapter
1	Protection of Generator against stator faults	1	V K Mehta	22.1
2	Rotor faults & its protection	1	V K Mehta	22.3
3	Differential protection, Percentage Differential Protection	1	V K Mehta	22.2
4	Restricted earth fault protection & Inter turn fault protection	2	V K Mehta	22.3

5	Numerical problems on % of winding Unprotected	1	V K Mehta	22
6	Percentage differential protection of transformers	2	V K Mehta	22.6
7	Numerical problems on C.T ratios	1	V K Mehta	22
8	Buchholz relay, Construction & Working	1	V K Mehta	22.8
9	Problems from University papers	1	-----	-----
TOTAL		11		

UNIT-IV: FEEDER & BUS BAR PROTECTION

S.No.	Topic covered	No. Of Classes required	Reference Book	Chapter
1	Protection of Lines, Over current	1	C L Wadhwa	14.9
2	Carrier current Protection	2	C L Wadhwa	14.9
3	Three zone Distance relay protection using Impedance relays	2	C L Wadhwa	14.9
4	Tran slay Relay	2	C L Wadhwa	14.9
5	Protection of Bus-bars, Differential Protection	1	C L Wadhwa	14.9
TOTAL		8		

UNIT-V : STATIC & DIGITAL RELAYS

S.No.	Topic covered	No. Of Classes required	Reference Book	Chapter
1	Static relay components	1	T S Madhav rao	1.1
2	Static Over current Relay, Static Distance relay	2	T S Madhav rao	6.1 & 6.2
3	Merits & demerits of Static over current Electro-magnetic relay	2	T S Madhav rao	1.4
4	Amplitude Comparator, Phase Comparator	2	T S Madhav rao	2.4
5	Types of amplitude & phase comparator	2	T S Madhav rao	2.5 & 2.6

6	Micro processor based digital relays, Impedance relays & Mho relays	2	T S Madhav rao	8.6
TOTAL		11		

UNIT VI: PROTECTION AGAINST OVERVOLTAGES & LIGHTNING

S.No.	Topic covered	No. Of Classes required	Reference Book	Chapter
1	Generation of Over voltages in Power Systems	1	C L Wadhwa	12.7
2	Protection against Lightning Over voltages	1	C L Wadhwa	12.8
3	Valve Type arrester	2	V K Mehta	24 .12
4	Zinc Oxide Lightning Arrester	1	V K Mehta	24.12
5	Insulation coordination, BIL	1	C L Wadhwa	16.1
6	Standard Impulse test Wave, volt-time Characteristics	1	C L Wadhwa	16.2
7	Grounded & Ungrounded neutral systems	1	C L Wadhwa	11.1
8	Effects of Ungrounded neutral on system performance	2	C L Wadhwa	11.2
9	Methods of Neutral grounding, Solid grounding	1	C L Wadhwa	11.3
10	Resistance grounding, Reactance Grounding	1	C L Wadhwa	11.4
11	Arcing grounds & grounding Practice	1	C L Wadhwa	11.6
TOTAL		13		

Total No. of classes Required: **73**

Signature of the Faculty

Signature of H.O.D

List of References:

S. No.	Title of the Book	Author	Publisher
1	Power System Protection & Switchgear	Badri ram & D N Viswakarma	TMH Publications
2	Fundamentals of Power system protection	Paithankar & S R Bhide	PHI
3	Electrical Power systems	C I Wadhwa	New Age Publications
4	Power Systems	V K Mehta	Khanna Publishers
5	Power System Protection Static relays	T S Madhav Rao	TMH Publications

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTUK, Kakinada)

An ISO 9001:2008, ISO 14001:2004 & OHSAS 18001:2007 Certified Institute.

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, www.diet.edu.in, E-mail: info@diet.edu.in

BATCH: III B.Tech EEE

SUBJECT: UTILIZATION OF ELECTRICAL ENGINEERING

(MID 1)

FACULTY: A. KRISHNA NAG, ASST.PROFESSOR, EEE Dept.

UNIT-1

1. Explain what do you mean by "Individual drive" and "Group drive ". Discuss their relative merits and demerits
2. A 500 V d.c. series motor runs at 500 r.p.m. and takes 60 amps. The resistances of the field and the armature are 0.3 and 0.2 Ohms, respectively. Calculate the value of the resistance to be shunted with the series field winding in order that the speed may be increased to 600 r.p.m., if the torque were to remain constant. Saturation may be neglected.
3. Though a.c. is superior to d.c. for electric drives, sometimes d.c. is preferred. Give the reasons and mention some of the applications.
4. A d.c. series motor drives a load, the torque of which varies as the square of the speed. The motor takes current of 30 amps, when the speed is 600 r.p.m. Determine the speed and current when the field winding is shunted by a diverter, the resistance of which is 1.5 times that of the field winding. The losses may be neglected.
5. Compare and contrast the slip ring and squirrel cage induction motors from the application point of view.
6. A series motor working on 500 V d.c supply runs at a speed of 1000 r.p.m. When The load current is 120 amp. The resistance of the motor 0.15 ohm, of which 0.04 ohm is the resistance of the field. Calculate the speed of the motor when the torque is half of the full load torque and the field winding is connected in parallel with a diverter of resistance 0.08 ohm, assuming an unsaturated magnetic circuit.

UNIT-2

1. What are the factors to be considered for inductor design in induction heating?
2. Explain the various applications of induction heating
3. An electric arc furnace consuming 5kW takes 15 minutes to just melt 1.5kg of aluminum, the initial temperature being 15°C. Find the efficiency of the furnace. Specific heat of aluminum is 0.212, melting point 658°C and latent heat of fusion is 76.8 cal per gram.
4. Explain in brief how heating is done in the following cases:
a) Resistance heating, b) Induction heating c) Dielectric heating.
5. A 20KW single-Phase, 220V resistance oven employs circular nichrome wire for its heating element, if the wire temperature is not to exceed 1227°C and the temperature of the charge is to be 427°C, calculate the size and length of the wire required. Assume emissivity = 0.9, radiating efficiency = 0.6 and specific resistance of wire = 1.09×10^{-6} Ω-m.
6. Explain the phenomenon of Dielectric Heating

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTUK, Kakinada)

An ISO 9001:2008, ISO 14001:2004 & OHSAS 18001:2007 Certified Institute.

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, www.diet.edu.in, E-mail: info@diet.edu.in

UNIT-3

1. Discuss the terms a) Luminous intensity, b) Luminous Flux.
2. Explain the various types of lighting schemes with relevant diagrams.
3. State and explain the various laws of Illumination.
4. A lamp of 500 candle power is placed at the centre of a room, 20m×10m×5m. Calculate the illumination in each corner of the floor and a point in the middle of a 10m wall at a height of 2m from floor.
5. Explain the different measurement techniques used for luminous intensity.
6. A lamp fitted with 120 degrees angled cone reflector illuminates circular area of 200 metre in diameter. The illumination of the disc increases uniformly from 0.5 metre-candle at the edge to 2 metre-candle at the centre. Determine i) The total light received ii) Average illumination of the disc iii) Average c.p. of the source.

UNIT-4

1. Give the construction and working of the following types of lamps:
(a) Arc lamp (b) Neon lamp (c) Sodium lamp
2. Compare Tungsten filament lamp with Fluorescent tubes.
3. Explain with sketches the constructional features of a filament lamp
4. Discuss the flood lighting with suitable diagrams
5. Along the center of a line of a corridor, number of lamps is fitted with reflectors. The distance between the two adjacent lamps is 7.5cm and the height of each lamp from the floor is 5m. The candlepower of each lamp is 100 in all directions below the horizontal. Determine the maximum and minimum illumination along the centerline of the floor and draw a graph showing the variation of the illumination along this line between the two lamps.
6. Write about a) High pressure mercury vapour & b) Mercury fluorescent lamps

UNIT-5

1. Write a brief notes on the single phase a.c. series motor and comment upon its suitability for traction services. How is its performance compared with the d.c. series
2. Draw the speed-time curve of a suburban service train and explain
3. A train accelerates to a speed of 48km/hr in 24sec. Then it coasts for 69sec under a constant resistance of 58 newton / tonne and brakes are applied at 3.3km/hr/sec in 11sec. calculate (i) the acceleration (ii) the coasting retardation (iii) the scheduled speed if station stoppage is 20secs. What is the effect of scheduled speed if station stoppage is reduced to 15sec duration, other conditions remaining same? Allow 10% for rotational inertia motor?
4. For a trapezoidal speed-time curve of an electric train, derive expression for a) maximum speed and b) distance between stops.
5. A train is to be run between two stations 5kms apart at an average speed of 50km/hr. If the maximum speed is to be limited to 70km/hr, acceleration to

DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTUK, Kakinada)

An ISO 9001:2008, ISO 14001:2004 & OHSAS 18001:2007 Certified Institute.

NH-5, Anakapalle – 531002, Visakhapatnam, A.P.

Phone: 08924-221111 / 221122/9963981111, www.diet.edu.in, E-mail: info@diet.edu.in

2km/hr/sec, braking retardation to 4km/hr/sec and coasting retardation to 0.1km/hr/sec, determine the speed at the end of coasting, duration of coasting period and braking period.

6. Discuss about a) Trapezoidal and b) Quadrilateral speed time curves

UNIT-6

1. Write short notes on sub-traction for single-phase A.C system
2. An electric locomotive is required to haul a train of 12 coaches each weighing 30 tonne on the main line service requiring an initial acceleration of 0.8km/hr/sec up a gradient of 1 in 100. Estimate the adhesive weight and hence the number of driving axles the locomotive must have, if the permissible axle loading is 20 tonne per axle. Assuming for rotational inertia to be 4%, for the coaches and 15% for the locomotive. Maximum coefficient of adhesion is 0.2 and the tractive resistance 5kg/tonne.
3. Explain dead weight, accelerating weight and train resistance referred to traction.
4. An electric locomotive of 100 tonne can just accelerate a train of 500 tonne (trailing weight) with an acceleration of 1km/hr/sec on an up gradient 1 in 1000. Tractive resistance of the track is 45 newton/tonne and the rotational inertia is 10%. If this locomotive is helped by another locomotive of 120 tonne, find i) the trailing weight that can be hauled up the same gradient, under the same condition ii) the maximum gradient, the trailing hauled load remaining unchanged. Assume adhesive weight expressed as percentage of total dead weight to be same for both the locomotives.
5. The scheduled speed of a trolley service is to be 53km/hr. The distance between stops is 2.8km. The track is level and each stop is of 30 sec duration. Using simplified speed-time curve, calculate the maximum speed, assuming the acceleration to be 2km/hr/sec, retardation 3.2km/hr/sec, the dead weight of the car as 16 tonnes, rotational inertia as 10% of the dead weight and track resistance as 40 newtons/tonne. If the overall efficiency is 80%, calculate (i) the maximum power output from the driving axles (ii) the specific energy consumption in watt-hr/tonne km.
6. Briefly explain the a.c. motors used in traction.