

ELECTRICAL & MECHANICAL ENGINEERING

BRIHANMUMBAI MUNICIPAL
CORPORATION

BMC EXAM GUIDE

Covers Complete Syllabus Of
Electrical & Computer Section Only

with 2100+ Most Probable Questions

Mr. Pramod Deshkari

M.E (E & TC)

(20+ Years Teaching Experience)

Section A **ELECTRICAL**



With
BMC 2019
Memory Based
Questions

ELECTRICAL SECTION

1. BASICS OF ELECTRICAL ENGINEERING
2. ELECTRICAL POWER SYSTEM
3. ELECTRICAL & ELECTRONICS MEASUREMENTS
4. ELECTRICAL MACHINES

COMPUTER SECTION

1. INDUSTRIAL AUTOMATION
2. INFORMATION COMMUNICATION TECHNOLOGY

Features

- Special book for Municipal Corporation Recruitment!
- Includes objective multiple choice questions for all subjects.
- Developed under expert and experienced professors.
- Covers Technical & Non Technical syllabus
- Simple and easy language for better understanding.

with

2100+

IMP Questions





ELECTRICAL ENGINEERING

BMC Sub Engineer & JE EXAM

BMC EXAM GUIDE

Covers Complete Syllabus Of
Electrical & Computer Section Only

with 2100+ Most Probable Questions

Mr. Pramod Deshkari

M.E (E & TC)

(20+ Years Teaching Experience)



**प्रकाशक**

Infinity Publications, Pune

पुस्तक मागणीसाठी संपर्क :**8263954946****9607155111****पहिली आवृत्ती : Jan- 2023****द्वितीय आवृत्ती : Aug-2023****अक्षरजुळणी, सजावट व मुखपृष्ठ****Team Infinity**

We Have made all possible effort to make this book error free however it is request to all students, if you find any error or want to give suggestions that we can incorporate into future editions, feel free Send us email info@infinitycivilacademy.com

डिसक्लेमर : या पुस्तकाचे संपादन व मुद्रण करताना योग्य ती काळजी व खबरदारी घेतलेली आहे. अनावधानाने राहून गेलेल्या आणि अनावधानाने निर्माण होणाऱ्या चुकीबद्दल आम्ही दिलगिर आहोत. त्यासाठी लेखक, प्रकाशक किंवा मुद्रक यांची कुठलीही जबाबदारी नाही. संकलनातून निर्माण होणा-या व त्याच्याशी संबंधित कुठल्याही प्रकारची देणी, नुकसानभरपाई यातून Infinity Publication मुक्त आहेत. सर्व पुणे न्यायालयाच्या कक्षेत





श्रीस्वामीसमर्थ...

स्वामींच्या चरणी अर्पण ...

PREFACE

Dear Aspirants,

We are extremely happy to present this book for Electrical and Electronics Engineering students those preparing for Bruhan Mumbai Corporation (BMC) Sub-Engineer or Junior Engineer posts and other various competitive examinations.

This book covers Twenty Seven most important topics from various technical subjects including important theory concepts and more than 1500 multiple choice questions. This book includes previous question paper with answer key with practice questions.

Brief review has been added for each topics before taking up the questions This book includes 2019 BMC memory based question paper with answer key and this book is written considering previous year questions for said examinations.

We tried to represent the concepts in brain mapping format and more in pictorial form and large number of diagrams and illustrations so that the topic understood properly. The topics within the chapters have been arranged in a proper sequence to ensure smooth flow of the subjects.

Topics such as PLC, SCADA and Automation also included in this along with important syllabus topics from computer . Number of MCQs been included so, we are sure that this book will cater all your needs for various examinations.

We are thankful to Infinity Academy and its Publication department for the encouragement and support that they have extended. We are also thankful to Directors and the staff members of Infinity Academy for their efforts to make this book as good as it is. We have jointly made every possible effort to eliminate all the errors in this book. However, if you find any, please let us know, because that will help us to improve further.

P. B. Deshkari

(M.E. (E & TC))

INDEX

1 BASICS OF ELECTRICAL ENGINEERING

CHAPTER - 1 INTRODUCTION TO ELECTRICAL ENGINEERING	9
CHAPTER – 2 DC CIRCUITS	15
CHAPTER - 3 AC FUNDAMENTALS	26
CHAPTER-4 THREE PHASE CIRCUITS.....	42
CHAPTER - 5 NANO TECHNOLOGY.....	49
CHAPTER – 6 ENERGY CONSERVATION METHODS	55
CHAPTER – 7 BATTERY & UPS	59
IMPORTANT QUESTIONS.....	66

2 ELECTRICAL POWER SYSTEM

CHAPTER – 1 STRUCTURE OF ELECTRICAL POWER SYSTEMS.....	83
CHAPTER – 2 POWER STATION EQUIPMENT'S.....	87
CHAPTER - 3 OVERHEAD LINES AND UNDERGROUND CABLES	92
CHAPTER – 4 TYPES OF POWER PLANTS	99
CHAPTER - 5 CLASSIFICATION OF INSULATING MATERIAL	127
CHAPTER - 6 CABLES AND WIRES.....	131
CHAPTER – 7 STANDARD WIRE GAUGE /AMERICAN WIRE GAUGE	140
IMPORTANT QUESTIONS.....	141

3 ELECTRICAL & ELECTRONICS MEASUREMENTS

CHAPTER – 1 PRESSURE MEASUREMENT.....	171
CHAPTER – 2 TEMPERATURE MEASUREMENT	189
CHAPTER – 3 FLOW MEASUREMENT	207
CHAPTER – 4 MEASUREMENT OF RESISTANCE	219
CHAPTER – 5 PRINCIPLES OF DIGITAL INSTRUMENTS.....	227
IMPORTANT QUESTIONS.....	233



4 ELECTRICAL MACHINES

CHAPTER – 1 THREE PHASE INDUCTION MOTOR.....	240
CHAPTER – 2 SINGLE PHASE MOTOR.....	250
IMPORTANT QUESTIONS.....	262

5 ANALOG & POWER ELECTRONICS

CHAPTER - 1 DIODES.....	288
CHAPTER – 2 APPLICATIONS OF DIODE	298
CHAPTER - 3 BJT (BIPOLAR JUNCTION TRANSISTOR).....	303
CHAPTER - 4 POWER AMPLIFIER	310
CHAPTER – 5 SILICON CONTROLLED RECTIFIER	316
CHAPTER – 6 POWER ELECTRONICS DEVICES	322
IMPORTANT QUESTIONS.....	329

6 DIGITAL ELECTRONICS

CHAPTER – 1 LOGIC GATES	368
CHAPTER – 2 ADDER AND SUBTRACTOR.....	375
CHAPTER – 3 DIGITAL COUNTERS	380
CHAPTER - 4 COMBINATIONAL CIRCUITS	383
CHAPTER – 5 SEQUENTIAL CIRCUITS.....	387
IMPORTANT QUESTIONS.....	389

7 MISCELLANEOUS TOPICS

CHAPTER -1 ILLUMINATION INTRODUCTION	395
CHAPTER – 2 SAFETY PRECAUTIONS	420
CHAPTER - 3 PROVISION OF NATIONAL BUILDING CODE	425
CHAPTER – 4 INDIAN ELECTRICITY RULES 1956 20- C	428
IMPORTANT QUESTIONS.....	431



COMPUTER SECTION

8 INDUSTRIAL AUTOMATION

CHAPTER – 1 PLC.....	443
CHAPTER – 2 SCADA.....	453
CHAPTER – 3 AUTOMATION	456
CHAPTER – 4 COMPUTER AIDED MANUFACTURING	459
CHAPTER – 5 COMPUTERS IN INDUSTRIAL ENGINEERING.....	477
CHAPTER - 6 ERP.....	480
IMPORTANT QUESTIONS.....	506

9 INFORMATION COMMUNICATION TECHNOLOGY

CHAPTER – 1 NETWORK TOPOLOGIES.....	521
CHAPTER - 2 COMPUTER NETWORK	528
CHAPTER - 3 DATA TRANSMISSION	540
CHAPTER – 4 INTERNET VS INTRANET	549
IMPORTANT QUESTIONS.....	552

10 BMC SUB ENGINEER (E&M) EXAM 2019

QUESTIONS.....	559
----------------	-----





ELECTRICAL | MECHANICAL ENGINEERING

BMC Sub Engineer & JE EXAM

1. BASICS OF ELECTRICAL ENGINEERING





CHAPTER - 1

INTRODUCTION TO ELECTRICAL ENGINEERING

1.1 Basic concept

1.1.1 Atomic structure

- Any substance is made up of matter, matter is made up of tiny particles called atoms and molecules.

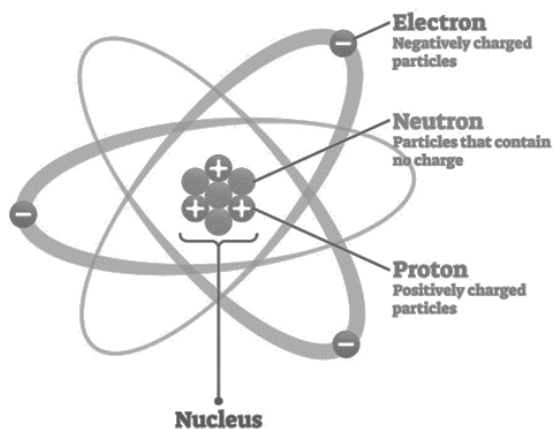


Fig: Atomic structure

- atom can be broken down into three constituents parts – protons, neutron, and electrons.
- Each of these parts has an associated charge, with protons (p) carrying a positive charge, electrons (e^-) having a negative charge,
- and neutrons possessing no net charge or electrically neutral
- Electrons are fundamental particles; however, protons and neutrons are made up of a different set of fundamental particles known as quarks.

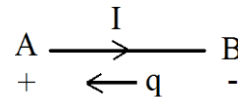
1.1.2 Charge (q):

- Physical property of matter that causes it to experience a force when placed in an electromagnetic field
- Unit: charge is measured in coulomb (C)
- Electron is negatively charged particles revolving around nucleus in orbits.
- Proton is positively charged particles present in nucleus
- Charge on electron = -1.6×10^{-19} C
- Charge on Proton = $+1.6 \times 10^{-19}$ C

1.1.3 Electric Current (i)

- Measured in ampere (A)
- Flow of electrons or negatively charged particles in definite direction is current.
- Rate of flow of charge $I = \frac{dq}{dt}$ Or

$$1 \text{ Ampere} = \frac{1 \text{Coulomb}}{1 \text{Second}}$$



- 1 Ampere current : 1 coulomb of charges flows through a conductor in 1 second
- Current is measured by ammeter
- Current is a scalar quantity even it has magnitude and direction because it does not obey vector laws of addition.
- Electric current has two effects
 - Heating effect eg. Application – Water heater
 - Magnetic effect eg. Application – Electric Generator

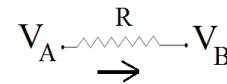
1.1.4 Potential difference:

Amount of work needed to move a charge from a reference point.

$$\text{Voltage} = \frac{\text{Energy}}{\text{charge}}$$

$$1 \text{ volt} = \frac{1 \text{ J}}{1 \text{ C}}$$

- It is difference between energy level.
- Current only flows from higher potential to lower potential



- $V_A > V_B$ then current flows from terminal A to B.

- Potential difference is $= V_A - V_B$
- Voltage drop across R is $= \frac{V_A - V_B}{R}$

potential difference is measured in volts (V)

- 1 volt potential difference - A voltage difference of one volt drives one ampere of current through a conductor that has a resistance of one ohm. Or
- One joule of work is required to move an electric charge of one coulomb across a potential difference of one volt. Or
- One volt is equivalent to one joule per coulomb.



IMPORTANT QUESTIONS

Part - 1

1. Basic source of magnetism

- A. Charged particles alone
- B. Movement of charged particles
- C. Magnetic dipoles
- D. Magnetic domains

1. Answer: B

2. Units for magnetic flux density

- A. Wb / m^2
- B. $\text{Wb} / \text{A.m}$
- C. A / m
- D. Tesla / m

2. Answer: A

3. Magnetic permeability has units as

- A. Wb / m^2
- B. $\text{Wb} / \text{A.m}$
- C. A / m
- D. Tesla / m

3. Answer: B

4. Magnetic permeability has units as

- A. Tesla
- B. Henry
- C. Tesla / m
- D. Henry / m

4. Answer: D

5. Magnetic field strength's units are

- A. Wb / m^2
- B. $\text{Wb} / \text{A.m}$
- C. A / m
- D. Tesla / m

5. Answer: C

6. Example for dia-magnetic materials

- A. Super conductors
- B. Alkali metals
- C. Transition metals
- D. Ferrites

6. Answer: A

7. Example for para-magnetic materials

- A. Super conductors
- B. Alkali metals
- C. Transition metals
- D. Ferrites

7. Answer: B

8. Example for ferro-magnetic materials

- A. Super conductors
- B. Alkali metals
- C. Transition metals
- D. Ferrites

8. Answer: C

9. Example for anti-ferro-magnetic materials

- A. Salts of transition elements
- B. Rare earth elements
- C. Transition metals
- D. Ferrites

9. Answer: A

10. Example for ferri-magnetic materials

- A. Salts of transition elements

- B. Rare earth elements
- C. Transition metals
- D. Ferrite

10. Answer: D

11. Which of following circuit element stores energy in electromagnetic field?

- A. Inductor
- B. Condenser
- C. Variable resistor
- D. Capacitor

11. Answer: A

12. Emf induced in a coil rotating in a uniform magnetic field will be maximum when the

- A. Flux linking with the coil is maximum
- B. Rate of change of flux linkage is minimum.
- C. Rate of change of flux linkage is maximum.
- D. Rate of cutting flux by coil sides is minimum.

12. Answer: C

13. The emf induced in a conductor rotating in bipolar field is

- A. Dc
- B. Ac
- C. Dc and ac both
- D. None of these

13. Answer: B

14. The direction of induced emf can be found by

- A. Kirchhoff's law
- B. Lenz law
- C. Fleming's right hand rule
- D. Laplace law

14. Answer: C

15. A coil with negligible resistance has 50 V across it with 10 mA. The inductive reactance is

- A. 50ohms
- B. 500ohms
- C. 1000ohms
- D. 5000ohms

15. Answer: D

16. A copper disc is rotated rapidly below a freely suspended magnetic needle. The magnetic needle starts rotating with velocity

- A. Equal to that of disc and in the same direction.
- B. Equal to that of disc and in the opposite direction.
- C. Less than that of disc and in the same direction.
- D. Less than that of disc but in opposite direction.



ELECTRICAL | MECHANICAL ENGINEERING

BMC Sub Engineer & JE EXAM

4. Electrical Machines





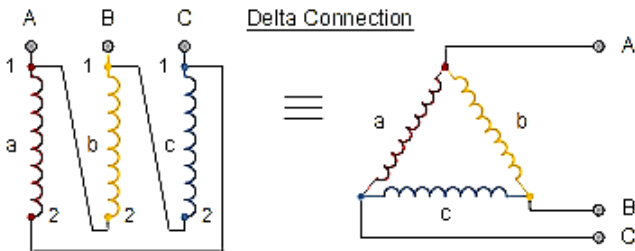
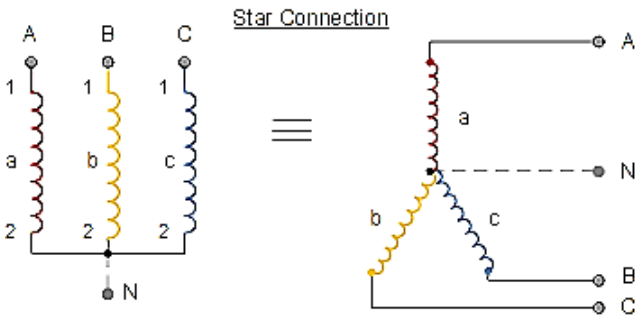
CHAPTER – 1

THREE PHASE INDUCTION MOTOR

Introduction

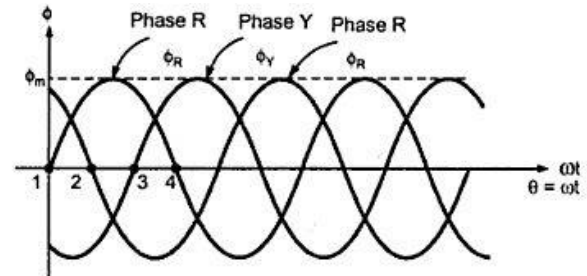
Production of rotating MMF

- The stator of an induction motor consists of a number of overlapping windings balanced by an electrical angle of 120°.



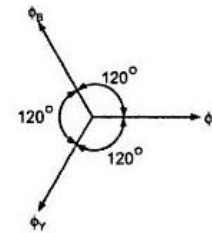
- When the stator is connected to a three-phase alternating current supply, it establishes a rotating magnetic field which rotates at a synchronous speed.
- The magnitude of this rotating field is constant and is equal to 1.5 times maximum magnitude of flux:

$$\phi(\theta, t) = 1.5\phi_m$$
- A three-phase induction motor consists of three phase winding (star or delta) as its stationary part called stator.
- The three phase currents flow simultaneously through the windings and are displaced from each other by 120° electrical.
- Each alternating phase current produces sinusoidal flux. So, all three fluxes are sinusoidal and are separated from each other by 120°.



(a) Waveforms of three fluxes

(b)



Assumed positive directions

- If the phase sequence of the windings is R-Y-B, then mathematical equations for the instantaneous values of the three fluxes ϕ_R, ϕ_B, ϕ_Y can be written as,

$$\phi_R = \phi_m \sin(\omega t)$$

$$\phi_B = \phi_m \sin(\omega t - 120)$$

$$\phi_Y = \phi_m \sin(\omega t - 240)$$
- As windings are identical and supply is balanced, the magnitude of each flux is ϕ_m .
- The waveform of the three fluxes is as given below:

Construction of Stator

- A three phase Induction motor mainly consists of two parts called as the Stator and the Rotor.
- The stator is the stationary part of the induction motor, and the rotor is the rotating part.

1. Stator:

- It is built up of high-grade alloy steel laminations to reduce eddy current losses.
- It has three main parts, namely outer frame, the stator core and a stator winding.

2. Outer frame

- It is the outer body of the motor to support the stator core and to protect the inner parts of the machine.

ELECTRICAL & MECHANICAL ENGINEERING

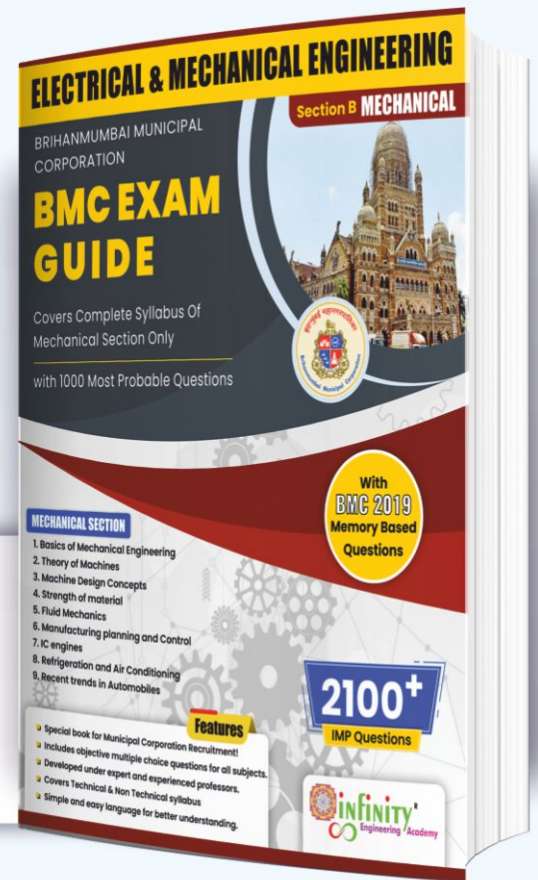
MECHANICAL SECTION

1. Basics of Mechanical Engineering
2. Theory of Machines
3. Machine Design Concepts
4. Strength of material
5. Fluid Mechanics
6. Manufacturing planning and Control
7. IC engines
8. Refrigeration and Air Conditioning
9. Recent trends in Automobiles

With
BMC 2019
Memory Based
Questions

Features

- Special book for Municipal Corporation Recruitment!
- Includes objective multiple choice questions for all subjects.
- Developed under expert and experienced professors.
- Covers Technical & Non Technical syllabus
- Simple and easy language for better understanding.



DOWNLOAD APP
INFINITY ACADEMY

or
Scan QR Code



Main Distributor

**DREAM
PATH**
WHOLESALE & DISTRIBUTORS

DREAM PATH BOOK STORES

📍 DREAM PATH BOOK STORE, GROUND FLOOR
INFINITY ACADEMY, MANKAR WADA
PATRYA MARUTI CHOWK PUNE-30

☎ 8263954946 | 9607155111

MRP

₹749

inclusive of all taxes