Academic Council Meeting No. and Date : 2 / April 30, 2021

Agenda Number : 4 **Resolution Number : 4.10 and 4.26**

Vidya Prasarak Mandal's
B. N. Bandodkar College of Science (Autonomous), Thane

Syllabus for

Programme : Bachelor of Science

Specific Programme : Microbiology

[F.Y.B.Sc. (Microbiology)]

Revised under Autonomy

From academic year 2021 - 2022

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Preamble

The promising branch of modern biology -Microbiology, broadly deals with the study of microorganisms invisible to the naked eye. Students study microbiology in all its forms and phases: classical to contemporary! From understanding the benefits of microbiomes that keep us healthy; the role bacteria and phages play in sustainable environment; Genes and their expression; about antibiotic resistance, pathogenic parasites, fungi, viruses and bacteria cause disease.

With the goal of engaging the learners in microbiological studies in the laboratory and *in silico*, harnessing experimental approaches that can be correlated better with the theoretical learning, the syllabus has been reframed.

Continuing the Choice Based Credit System (CBCS) implemented by the esteemed University from the academic year 2016-2017, the existing syllabus of F. Y. B. Sc. Microbiology is restructured according to the CBCS pattern for its implementation from 2021-22 under the autonomous status of VPM's B. N. Bandodkar College of Science. While earlier revision of the syllabus took care of balancing both the basic techniques and some of the advance techniques in Microbiology, the present revision is related to restructuring of syllabus under autonomy updating it with a few more changes.

The concepts of eukaryotic cytoskeleton that is included as a part of eukaryotic cell structure, would help learner gain in depth knowledge about cellular functions and the harmony maintained. To keep up the pace with the development in field of Microscopy 'foldscope' has been newly introduced. Attempt has been made to facilitate understanding of students related to growth by adding a topic on 'growth of microbes in natural environment'.

Human Microbiome has been introduced to make the learners aware about its significant influence on human health. Attempt has been made to make students aware about the modern personalized treatment regimen.

Eligibility :

Passed 12th standard (HSC) of Maharashtra State Board / CBSE / ICSE board or equivalent.

Duration: 3 years

Mode of Conduct:

Laboratory Practicals / Offline lectures / Online lectures

Program Outcome

Program Specific Outcome

Students would be able to study basis of microbial world by knowing biochemistry, genetics, immunology, cell structure and functions, along with basic techniques that can help identify microbial cultures. Students would be able to apply knowledge to make positive use of microbial systems for betterment of community and for sustainable development.

VPM's B. N. Bandodkar College of Science (Autonomous), Thane

F.Y.B.Sc. (Microbiology)

Structure of Programme

Course Code	Course Title	No. of lectures	Credits
BNBUSMB1T1	Fundamentals of Microbiology	**45**	**2**
BNBUSMB1T2	Basic Techniques in Microbiology	**45**	**2**
BNBUSMB1P1	Section I Fundamentals of Microbiology (Practicals Based on Units I, II and III of BNBUSMB1T1)	**90**	**2**
	Section II Basic Techniques in Microbiology (Practicals Based on Units I, II and III of BNBUSMB1T2)		
Total		**180**	**6**

Course Code	Course Title	No. of lectures	Credits
BNBUSMB2T1	Basic Microbiology	**45**	**2**
BNBUSMB2T2	Exploring Microbiology	**45**	**2**
BNBUSMB2P1	Section I : Basic Microbiology (Practicals Based on Units I, II and III of BNBUSMB2T1)	**90**	**2**
	Section II : Exploring Microbiology (Practicals Based on Units I, II and III of BNBUSMB2T2)		
Total		**180**	**6**

Semester I

Course Code	Course Title	Credits	No. of lectures
BNBUSMB1T1	**Fundamentals of Microbiology**	2	

Learning Outcomes: Learner will

- Get an introduction to history and scope of microbiology.
- Obtain knowledge about the structural details of prokaryotic cell organelles, genetic material and other components along with their function.
- Get introduced to the concept and need of biosafety in microbiology.
- Be well versed with the various aspects of macromolecules and would be equipped with the basic knowledge for in-depth study of biochemistry and metabolism.

Unit I: History of Microbiology & Prokaryotic cell Structure	**1.1 History, Introduction & Scope of Microbiology:** a. History b. Discovery of microorganisms c. Conflict over spontaneous generation d. Golden Age of Microbiology - Koch Postulate, Medical Microbiology, Immunology, Discovery of chemotherapeutic drugs (magic bullet) e. Development of industrial microbiology and microbial ecology f. Scope and relevance of microbiology g. Future of microbiology **1.2 Biosafety in Microbiology: (Teaching pedagogy – Case study & presentation)** a. Means of laboratory infection b. Potentially hazardous procedures c. Responsibility d. Risk Assessment e. Restricted access & Safety equipments f. Immunization and medical records g. Training of personnel h. Laboratory procedures i. Levels of Containment **1.3 Prokaryotic Cell Structure and functions:** a. Cell wall b. Cell membrane c. Components external to cell wall-Capsule, Slime layer, Flagella, Pili, Fimbriae d. Cytoplasmic matrix-Inclusion bodies, magnetosomes, ribosomes, gas vesicles e. Nucleoid, Plasmids f. Bacterial endospores and their formation	**15**

Unit II: Eukaryotic Cell Structure	**2.1 Eukaryotic Cell Structure:** a. Overview of Eucaryotic cell structure b. Overview of major functions of cytoskeleton c. The plasma membrane and membrane Structure d. Cytoplasmic matrix, microfilaments (structure & composition), intermediate filaments, and microtubules (structure & composition, MTOC), Motor proteins (kinesins, dyenins, myosin in brief) e. Organelles of the Biosynthetic-secretory and endocytic pathways – Endoplasmic reticulum & Golgi apparatus. Definitions of Lysosome, Endocytosis, Phagocytosis, Autophagy, Proteasome f. Eucaryotic ribosomes g. Mitochondria h. Chloroplasts i. Nucleus –Nuclear Structure j. External Cell Coverings: Cilia and Flagella k. Comparison of Prokaryotic and Eukaryotic Cells	**15**
Unit III: Macromolecules	**3.1 Chemical foundations:** a. Biomolecules as compounds of carbon with a variety of functional groups. b. Universal set of small molecules. c. Macromolecules as the major constituents of cells. d. Configuration and Conformation with definitions and suitable examples only. e. Types of Stereoisomers and importance of stereoisomerism in biology. f. Types of bonds and their importance: Electrovalence, covalent, ester, phosphodiester, thioester, peptide, glycosidic **3.2 Water- Structure, properties in brief** **3.3 Carbohydrates:** a. Definition, Classification, Biological role b. Monosaccharides, oligosaccharides (maltose, cellobiose, sucrose, lactose) c. Polysaccharide (starch, glycogen, peptidoglycan, cellulose) **3.4 Amino acids & Proteins:** a. General structure and features of amino acids (emphasis on amphoteric nature) Classification by R-group, b. Uncommon amino acids and their functions c. Peptides & proteins- Definition & general features and examples with biological role d. Primary, secondary, tertiary, quaternary structures - Brief outline **3.5 Nucleic acids:** a. Nitrogenous bases- Purines, Pyrimidines, Pentoses - Ribose, Deoxyribose b. Nomenclature of Nucleosides and nucleotides, N-β-glycosidic bond, polynucleotide chain to show bonding between nucleotides (Phosphodiester bonds) c. Basic structure of RNA and DNA	**15**

Course Code	Course Title	Credits	No. of lectures
BNBUSMB1T2	**Basic Techniques in Microbiology**	2	

Learning outcome: Learner will be able to

- Understand the detailed mechanism of staining techniques to observe different types of microorganisms
- Know different methods for control of Microbes
- Implement the knowledge acquired, to appropriately identify the microscopic techniques
- Understand the nutritional requirements of bacteria and their nutritional types.
- Have basic understanding of preservation and collection of microbial cultures.

Unit I: Microscopy & Staining	**1.1 Microscopy:** a. History of microscopy, Optical spectrum, Lenses and mirrors: b. Simple and compound light microscope, c. Dark field Microscopy, d. Phase contrast e. Foldscope **1.2 Staining procedures** a. Dyes and stains: Types, Physicochemical basis Fixatives, Mordants, Decolorizers b. Simple and differential staining c. Special staining (Cell wall, Capsule, Lipid granules Spores, Metachromatic granules & Flagella)	**15**
Unit II: Control of Microorganisms	**2.1 Definition of frequently used terms & Rate of microbial death, Factors affecting the effectiveness of antimicrobial agents & Properties of an ideal disinfectant** **2.2 Physical methods of microbial control** a. Dry & moist heat – mechanisms, instruments used and their operations b. Electromagnetic (Ionizing) radiations - mechanisms, advantages & disadvantages, importance of cold sterilization c. Bacteria proof filters d. Low temperature e. Osmotic pressure f. Desiccation **2.3 Chemical methods of microbial control - mechanism & advantages & disadvantages (if any) applications:** a. Phenolics b. Alcohols c. Heavy metals and their compounds d. Halogens e. Quaternary ammonium compounds f. Halogens g. Dyes h. Surfaces active agents / Detergents i. Aldehydes j. Peroxygens k. Sterilizing gases **2.4** Evaluation of disinfectant –Tube dilution & Agar plate techniques, Phenol coefficient, Tissue toxicity index **2.5** Introduction to Chemotherapeutic agents	**15**

Unit III: Microbial Nutrition, Cultivation, Isolation & Preservation	**3.1** Nutritional requirements – Carbon, Oxygen, Hydrogen, Nitrogen, Phosphorus, Sulfur and growth factors (definition only) **3.2** Nutritional types of microorganisms **3.3** Types of Culture media with examples **3.4** Isolation of microorganisms and pure culture techniques **3.5** Cultivation of anaerobic microorganisms **3.6** Preservation of microorganisms **3.7** Culture Collection Centers	**15**

Course Code **BNBUSMB1P1**	**Course Title** **Based on BNBUSMB1T1 and Based on BNBUSMB1T2**	**Credits** **2**	**No. of lectures**
Practical 1	**Practicals Based on Unit I of BNBUSMB1T1**		
a.	Assignment: Brief overview of a Technique / Equipment / Concept in Microbiology from Past to Present		**3**
b.	Special Staining a. Cell Wall b. Capsule c. Endospore d. Lipid e. Metachromatic Granules		**15**
Practical 2	**Practicals Based on Unit II of BNBUSMB1T1**		
a.	Handling corrosive chemical using rubber teat method for pipetting. Prevention of mouth pipetting and use of auto-pipettes		**3**
b.	Explain safety inoculation hood for infection inoculations and laminar air flow		**3**
c.	On accidental spillage of/ breakage of culture containers-precautions to be taken		**3**
d.	Demonstration of microbes in air, cough, on table surface, finger tips		**6**
e.	Permanent slides of Eukaryotes & its organelles (Amoeba & Paramecium)		**3**
Practical 3	**Practicals Based on Unit III of BNBUSMB1T1**		
a.	Carbohydrates- Benedicts, Molisch's test.		**3**
b.	Proteins, amino acids- Biuret, Ninhydrin		**3**
c.	Nucleic acid detection by DPA and Orcinol		**3**

Practical 4	**Practicals Based on Unit I of BNBUSMB1T2**	
a.	Parts of a microscope	**1**
b.	Dark field and Phase contrast: Demonstration	**2**
c.	Monochrome and differential staining procedures, Gram staining& Negative Staining	**6**
d.	Observing random samples using foldscope	**2**
Practical 5	**Practicals Based on Unit II of BNBUSMB1T2**	
a.	Introduction to Laboratory equipments, disinfection & discarding techniques in laboratory	**1**
b.	Methods of preparation of glassware for Sterilization (Pipettes, Petri Plates, Plastic wares, Flasks, Micropipettes)	
c.	Sterilization equipments: Principle, Construction and Working of • Autoclave • Hot Air Oven	**4**
d.	Effect of UV Light, Osmotic Pressure and Heavy metals (oligodynamic action) on Microorganisms	**6**
e.	Effect of dyes, phenolic compounds and chemotherapeutic agents (Disk diffusion method)	**2**
Practical 6	**Practicals Based on Unit III of BNBUSMB1T2**	
a.	Preparation of Culture Media • Liquid medium (Nutrient Broth) • Solid Media (Nutrient agar, Sabourauds agar) • Preparation of slant, butts & plates	**6**
b.	Inoculation techniques and Study of Growth • Inoculation of Liquid Medium • Inoculation of Solid Media (Slants, Butts and Plates) • Study of Colony Characteristics of pigment & non-pigment producing bacteria. • Study of Motility (Hanging Drop method & stab culture)	**9**
c.	Use of Differential & Selective Media: (MacConkey & Salt Mannitol Agar)	**3**
d.	Methods of Preservation of culture	**3**

References

Course Code	Course Title
BNBUSMB1T1	Fundamentals of Microbiology

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Prescott, Harley & Klein's Microbiology	Willey, Sherwood & Woolverton	McGraw-Hill	7th	2008
2.	Microbiology	Michael J Pelczar Jr. E. C. S Chan Noel R. Krieg	Tata McGraw-Hill	5th	1993
3.	Lehninger Principles of Biochemistry	D. Nelson & M. Cox	W H Freeman & Company	4th	2005
4.	Code of Safety in Microbiological Laboratories	Bureau of Indian Standard	Published under the auspices of the Right to Information Act 2005	-	1987
5.	Fundamentals of Biochemistry	D. Voet and J. Voet	John Wiley & Sons	4th	2011
6.	Cell & Molecular Biology: Concepts & Experiments	Gerald Karp	John Wiley & Sons	6th	2010

Course Code	Course Title
BNBUSMB1T2	Basic Techniques in Microbiology

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Prescott, Harley & Klein's Microbiology	Willey, Sherwood & Woolverton	McGraw-Hill	7th	2008
2.	Microbiology	Michael J Pelczar Jr. E. C. S Chan Noel R. Krieg	Tata McGraw-Hill	5th	1993
3.	Fundamentals of Microbiology	Martin Frobisher Ronald Hinsdill Koby Crabtree Clyde GoodHeart	Thomson Learning	6th	1957
4.	Fundamental Principles of Bacteriology	A J Salle	McGraw-Hill	2nd	1943
5.	General Microbiology	Stanier, Ingraham, Wheelis & Painter	McMillan Press Ltd.	5th	1987
6.	Microbiology: An Evolving Science	Slonczewski and Foster	Norton & Company, Inc.	4th	2016
7.	https://www.foldscope.com				

Semester II

Course Code	Course Title	Credits	No. of lectures
BNBUSMB2T1	**Basics of Microbiology**	2	

Learning outcome: Learner will be able to:

- Identify features of a virus and special bacteria and their medical significance
- Understand basic morphological and structural features of Algae, Fungi, Protozoa, and molds.
- Gain knowledge about the ecological, clinical and biological importance of these groups of microbes.
- Have basic understanding of microbial growth
- Carry out enumeration of microorganisms using appropriate techniques
- Comprehend the effect of various environmental parameters on the growth of microorganisms.

Unit I: Study of Different groups of Microbes-I	**1.1 Viruses:** a. Historical highlights, General properties of Viruses, prions, viroids b. Structure of viruses- Capsids, envelopes, genomes c. Cultivation of viruses- overview d. Bacteriophages: lytic cycle, Lysogeny, structure and life cycle of T4 phage **1.2 Rickettsia, Coxiella, Chlamydia, Mycoplasma**: general features, medical significance **1.3 Actinomycetes:** General features of nocardia and streptomyces. Importance: ecological, commercial and medical **1.4 Archaea:** Introduction- major Archaeal physiological groups, Archaeal cell wall, lipids and membranes, Ecological importance	**15**
Unit II: Study of Different groups of Microbes-II	**2.1 Protozoa** a. Ecology and Morphology of Protozoa b. Major categories of Protozoa based on motility, reproduction c. Medical importance of Protozoa d. Life cycle of Entamoeba histolytica **2.2 Algae** a. Characteristics of algae: morphology, pigment, reproduction b. Cultivation of algae c. Major groups of algae: an overview d. Biological and economic importance of algae e. Lichen symbiosis f. Differences between Algae and Cyanobacteria **2.3 Fungi** a. Characteristics: structure, reproduction b. Cultivation of fungi c. Major fungal divisions: an overview d. Life cycle of yeast e. Biological and economic importance **2.4 Slime Molds**	**15**

Unit III: Microbial Growth	**a. Definition of growth**, Mathematical Expression, Growth curve **b. Measurement of growth** **c. Direct microscopic count**–Breed's count, Petroff–Hausser counting chamber- Hemocytometer **d. Viable count** – Spread plate and Pour plate technique **e. Measurements of cell constituents** **f. Turbidity measurements**–Nephelometer and spectrophotometer techniques **g. Synchronous growth**, **Continuous growth** (Chemostat and Turbidostat) **h. Influence of environmental factors on growth** **i. Microbial growth in natural environment** **j. Counting viable non-culturable organisms**-Quorum sensing techniques	**15**

Course Code BNBUSMB2T2	Course Title **Exploring Microbiology**	Credits 2	No. of lectures

Learning outcome: Learner will be able to:

- Understand various types of interactions of microbes with other living being as well as within the microbial world
- Know the different types of infections
- Discern common terms in epidemiology.
- Learn about human microbiome and its effect on human health.
- Have knowledge about construction and working of basic instruments used in routine microbiological, biochemical estimations as well as some advanced instruments in the field of microscopy

Unit I: Microbial Interaction	**1.1 Types of Microbial Interactions**: Mutualism, Cooperation, Commensalism, Predation Parasitism, Amensalism, Competition **1.2 Human Microbe Interactions** a. Normal flora of the human body: Skin, Nose & Nasopharynx, Oropharynx, Respiratory tract, Eye, External ear, Mouth, Stomach, Small intestine, Large intestine, Genitourinary tract b. Relationship between microbiota& the host c. Gnotobiotic animals **1.3 Microbial associations with vascular plants** a. Phyllosphere b. Rhizosphere & Rhizoplane c. Mycorrhizae d. Nitrogen fixation: Rhizobia, Actinorhizae e. Stem nodulating Rhizobia f. Fungal & Bacterial endophytes g. Agrobacterium & other plant pathogens	**15**
Unit II: Microbes & Human Health	**2.1 Difference between infection & disease** **2.2 Important terminologies:** Primary infection, secondary infection. Contagious infection, occupational disorder, clinical infection, subclinical infection, Zoonoses, genetic disorder, vector borne infection **2.3 Basic terms in epidemiology** **2.4 Factors affecting infection** a. Microbial factors: adherence, invasion, role of virulence factors in invasion, colonization & its effects. b. Host factors: natural resistance, species resistance, racial resistance, Individual resistance: c. Factors influencing individual resistance: Age, nutrition, personal hygiene, stress, hormones, Addiction to drugs/ alcohol. d. Interaction between Microbes & host is dynamic **2.5 Host defense against infection: Overview** a. First line of Defence: for skin, respiratory tract, gastrointestinal tract, genitourinary tract, eyes b. Second line of Defence: Biological barriers: Phagocytosis, Inflammation c. Third line of Defence: Brief introduction to antibody mediated & cell mediated immunity **2.6 Influence of microbiome on human health and disease**	

Unit III: Advance Techniques in Microbiology & Instrumentation	**3.1 Electron Microscope**: TEM, SEM, **3.2** Contrast enhancement for electron microscope **3.3** Fluorescent Microscope, Confocal Microscope, CryoEM, Scanning probe AFM **3.4** pH meter, pH meter Validation and calibration **3.5** Colorimeter **3.6** Validation and calibration of Autoclave & Hot air Oven **3.7 Concepts:** Laminar air flow systems, Biosafety cabinets, Walk in Incubators, Industrial autoclaves, Cold Room	**15**

Course Code	**Course Title**	**Credits**	**No. of lectures**
BNBUSMB2P2	**Based on BNBUSMB2T1 and BNBUSMB2T2**	**2**	
Practical 1	**Practicals Based on Unit I of BNBUSMB2T1**		
a.	Spot assay and plaque assay of Bacteriophage (Demonstration)		**3**
b.	Slide Culture technique (Actinomycetes & Fungal Culture)		**3**
Practical 2	**Practicals Based on Unit II of BNBUSMB2T1**		
a.	Isolation of yeast, cultivation of other fungi, cultivation on Sabourauds agar		**3**
b.	Static & Shaker Cultures		**6**
c.	Fungal Wet mounts & Study of Morphological Characteristics: Mucor, Rhizopus, Aspergillus, Penicillium		
d.	Permanent slides of Algae		
Practical 3	**Practicals Based on Unit III of BNBUSMB2T1**		
a.	Growth curve		**4**
b.	Breed's Count		**3**
c.	Haemocytometer		**3**
d.	Viable count: Spread plate and pour plate		**12**
e.	Brown's opacity		**2**
f.	Effect of pH and temperature on growth		**3**
g.	Measurement of cell dimensions-Micrometry		**3**
Practical 4	**Practicals Based on Unit I of BNBUSMB2T2**		
a.	Normal flora of the Skin		**6**
b.	Wet Mount of Lichen		**3**
c.	Bacteroid Staining & Isolation of *Rhizobium*		**6**
d.	*Azotobacter* isolation & staining		**6**

Practical 5	**Practicals Based on Unit II of BNBUSMB2T2**	
a.	Study of virulence factors – Enzyme Coagulase	**3**
b.	Study of virulence factors – Enzyme Hemolysin	**3**
c.	Study of virulence factors – Enzyme Lecithinase	**3**
Practical 6	**Practicals Based on Unit III of BNBUSMB2T2**	
a.	Use of standard buffers for calibration and determination of pH of a given solution	**3**
b.	Determination of λ max & Verification of Beer Lambert's law	**6**
c.	Writing of SOP's for Instruments	**3**
d.	Visit to a Microbiology laboratory in a research Institute	**3**

References

Course Code	Course Title
BNBUSMB2T1	Basics of Microbiology

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Prescott, Harley & Klein's Microbiology	Willey, Sherwood & Woolverton	McGraw-Hill	7th	2008
2.	Microbiology	Michael J Pelczar Jr. E. C. S Chan Noel R. Krieg	Tata McGraw-Hill	5th	1993
3.	General Microbiology	Stanier, Ingraham, Wheelis & Painter	McMillan Press Ltd.	5th	1987
4.	Brock Biology of Microorganisms	Madigan, Martinko, Stahl & Clark	Benjamin Cummings	13th	2012
5.	Microbiology: An Evolving Science	Slonczewski and Foster	Norton & Company, Inc.	4th	2016

Course Code	Course Title
BNBUSMB2T2	Exploring Microbiology

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Foundations in Microbiology	Kathleen Park Talaro& Arthur Talaro	McGraw Hill	4th	2002
2.	Microbiology: An Introduction	Tortora, Funke and Case	Adisson Wesley Longman Inc	10th	2010
3.	Medical Microbiology Vol II	Cruikshank	-	-	-
4.	Prescott, Harley & Klein's Microbiology	Willey, Sherwood & Woolverton	McGraw-Hill	7th	2008
5.	Microbiology	Michael J Pelczar Jr. E. C. S Chan Noel R. Krieg	Tata McGraw-Hill	5th	1993
6.	Microbiology: An Evolving Science	Slonczewski and Foster	Norton & Company, Inc.	4th	2016
7.	https://doi.org/10.1186/s13099-018-0230-4				

Evaluation Scheme

Internals

Class test	Assignment/ Study tour with report/Journal Movie club presentation/ Presentation of mini-research project work/ volunteering for Department fest/ poster making/ exhibition/ Departmental contribution/ case study presentation	Active Participation & Leadership qualities	Total
20	10	10	40

Internal Examination: Based on Unit 1 / Unit 2 / Unit 3

Duration: 40 mins **Total Marks: 20**

No. of Questions: 15

Q. 1	**Answer the following choosing the correct alternative.**								**10**
	1	Based on Unit I / II / III							
	a		b		c		d		
	2	Based on Unit I / II / III							
	a		b		c		d		
	3	Based on Unit I / II / III							
	a		b		c		d		
	4	Based on Unit I / II / III							
	a		b		c		d		
	5	Based on Unit I / II / III							
	a		b		c		d		
	6	Based on Unit I / II / III							
	a		b		c		d		
	7	Based on Unit I / II / III							
	a		b		c		d		
	8	Based on Unit I / II / III							
	a		b		c		d		
	9	Based on Unit I / II / III							
	a		b		c		d		
	10	Based on Unit I / II / III							
	a		b		c		d		
Q.2	**Answer the following choosing the correct alternative.**								**10**
	1	Based on Unit I / II / III							
	a		b		c		d		
	2	Based on Unit I / II / III							
	a		b		c		d		
	3	Based on Unit I / II / III							
	a		b		c		d		
	4	Based on Unit I / II / III							
	a		b		c		d		
	5	Based on Unit I / II / III							
	a		b		c		d		

Theory Examination: Suggested Format of Question paper

Duration: 2 Hours **Total Marks: 60**

All questions are compulsory

Q. 1	Answer ***any two*** of the following		**16**
	a	Based on Unit I	
	b	Based on Unit I	
	c	Based on Unit I	
Q. 2	Answer ***any two*** of the following		**16**
	a	Based on Unit II	
	b	Based on Unit II	
	c	Based on Unit II	
Q. 3	Answer ***any two*** of the following		**16**
	a	Based on Unit III	
	b	Based on Unit III	
	c	Based on Unit III	
Q. 4	Answer ***any six*** of the following		**06**
(i)	a	Based on Unit I / II / III	
	b	Based on Unit I / II / III	
	c	Based on Unit I / II / III	
	d	Based on Unit I / II / III	
	e	Based on Unit I / II / III	
	f	Based on Unit I / II / III	
	g	Based on Unit I / II / III	
	h	Based on Unit I / II / III	
	i	Based on Unit I / II / III	
(ii)	Answer ***any two*** of the following		**06**
	a	Based on Unit I / II / III	
	b	Based on Unit I / II / III	
	c	Based on Unit I / II / III	

Marks Distribution and Passing Criterion for Each Semester

Theory					Practical		
Course Code	Internal	Min marks for passing	Theory Examination	Min marks for passing	Course Code	Practical Examination	Min marks for passing
BNBUSMB1T1	**40**	**16**	**60**	**24**	BNBUSMB1P1	**100**	**40**
BNBUSIMBT2	**40**	**16**	**60**	**24**			

Theory					Practical		
Course Code	Internal	Min marks for passing	Theory Examination	Min marks for passing	Course Code	Practical Examination	Min marks for passing
BNBUSMB2T1	**40**	**16**	**60**	**24**	BNBUSMB2P1	**100**	**40**
BNBUSMB2T2	**40**	**16**	**60**	**24**			

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