

AC- 04 / 12 / 2020

Item No- 5.6



**RayatShikshanSanstha's
KARMAVEER BHURAO PATIL COLLEGE, VASHI.
NAVI MUMBAI
(AUTONOMOUS COLLEGE)
Sector-15- A, Vashi, Navi Mumbai - 400 703**

Syllabus for T.Y.B. Voc. Course

Program: T.Y.B. Voc. Course

Course: T.Y.B. Voc. Food Technology

**(Choice Based Credit, Grading and Semester System
with effect from the academic year 2021-2022)**

RayatShikshanSanstha's
Karmaveer Bhaurao Patil College Vashi, Navi Mumbai
Autonomous College
[University of Mumbai]
Syllabus for Approval

Sr. No.	Heading	Particulars
1	Title of Course	T.Y.B.Voc. Food Technology
2	Eligibility for Admission	S.Y.B.Voc. Food Technology
3	Passing Marks	40%
4	Ordinances/Regulations (if any)	-
5	No. of Years/Semesters	Three years/ Six semester
6	Level	U.G.
7	Pattern	Semester
8	Status	-
9	To be implemented from Academic year	2021-22

Preamble

Food Technology is a B.Voc. course and an under-graduation programme at Karmaveer Bhaurao Patil College Vashi, Navi Mumbai [Autonomous College]

Food science is the study of the physical, biological, and chemical makeup of food; the causes of food deterioration; and the concepts underlying food processing. Food scientists and technologists apply scientific disciplines including chemistry, engineering, microbiology, and nutrition to the study of food to improve the safety, nutrition, wholesomeness and availability of food. Depending on their area of specialization, food scientists may develop ways to process, preserve, package, and/or store food according to industry and government specifications and regulations.

Food technology is the application of food science to the selection, preservation, processing, packaging, distribution, and use of safe food. Related fields include analytical chemistry, biotechnology, engineering, nutrition, quality control, and food safety management.

Food processing is the treatment of food substances by changing their properties to preserve it, improve its quality or make it functionally more useful. Food processors take raw animal, vegetable, or marine materials and transform them into edible products through the application of labor, machinery, energy, and scientific knowledge. Chemical, biological, and mechanical processes are used to convert relatively bulky, perishable, and typically inedible food materials into shelf-stable, convenient, and palatable foods and beverages.

The food processing sector is highly fragmented industry. It widely comprises of the following sub-segments: Fruits and vegetables, Milk and milk products, beer and alcoholic beverages, meat and poultry, marine products, grain processing, packaged or convenience food and packaged drinks. A huge number of entrepreneurs in this industry are small in terms of their production and operations, and are largely concentrated in the unorganized segment.

With potential of being the biggest in the world India next to China is the world's second largest producer of food and processed food products. India is having the biggest consumption category, with spending on food accounting for nearly 21% of India's GDP and with a market size of \$181 billion. The Indian domestic food market is expected to grow by nearly 40% of the current market size to \$258 billion by 2015 and \$344 billion by 2025 (World of Food India, 2011; Merchant, 2008).

The content of a syllabus should be such that it maintains continuity with the course content of graduate course. The present curriculum is made keeping this in mind and is an effort to impart fundamental knowledge of the subject needed at this level. The curriculum is designed as per the guidelines for Choice Based Credit System and reflects the total credit, teaching hours and evaluation pattern.

Program outcomes

- To prepare students as a qualified food technologist for Food industries, research organization and teaching.
- To provide students with a solid foundation in basic sciences related to food technology, food science and food technology & engineering.
- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and device for food industry and provide solutions for the challenges in food industry as well as in agriculture.
- To train students in professional and ethical attitude, effective communication skills, teamwork skills and multidisciplinary approaches related to food technology and engineering.
- To provide student with an academic environment aware of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career.

Program Specific Outcomes

1. Graduate will able to focus on the importance of safe processed nutritious food.
2. Graduates will demonstrate an ability to design or process food products as per the needs and specifications.
3. Graduates will demonstrate an ability to work in Food industries, research organization and teaching.
4. Graduate will demonstrate skills to use modern tools and equipment to analyze food prone infection and food spoilage.
5. Graduates will demonstrate knowledge of professional and ethical responsibilities
6. Graduate will be able to understand economic importance of food products and food laws.
7. To understand the knowledge of food, food analysis, food spoilage and principles of food preservation, food QA and QC
8. To get the practical knowledge of bakery and confectionary technology

To develop a skill in Entrepreneurship Development and Project Management

Program Specific Outcome (Considered Third year)

- To understand the knowledge of technology of processing of Fruit and Vegetables, Physical properties of food, Food Processing and Equipment, Food Biotechnology and nutraceuticals, Unit operation in Food industry.
- To gain the knowledge of Sensory Evaluation of Food
- To get the practical knowledge of New product development.
- To develop the knowledge about Food Quality Assurance

Scheme of examination for Each Semester:

Continuous Internal Evaluation: 40 Marks (Common Test-20 Marks & 20 Marks for-

Assignment, Projects, Group discussion, Open book test, online test etc.) based on all units of each paper.

Semester End Examination: 60 Marks will be as follows -

I.	Theory: The Semester End Examination for theory course work will be conducted as per the following scheme.	
	Each theory paper shall be of two hours duration.	
	All questions are compulsory and will have internal options.	
	Q – I	Subject questions from Unit – I (having internal options.) 20 M
	Q – II	Subjective questions from Unit – II (having internal options.) 20 M

	Q – III	Objective type questions based on both the Units with equal weightage. 20 M
II.	Practical	The Semester End Examination for practical course work will be conducted as per the following scheme.
Sr. No.	Particulars of Semester End Practical Examination	Marks%
1	Laboratory Work	40
2	Journal	05
3	VIVA	05
	TOTAL	50

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For the subject of food technology there shall be five papers for each paper having 3.3credits and 15 lectures.

Semester V

SR. NO	PAPER NO.	PAPER NAME
1	UGFT 501	Processing of Fruit and Vegetables
2	UGFT 502	Analytical properties of food
3	UGFT 503	Sensory Evaluation of foods
4	UGFT 504	Food Processing and Equipment
5	UGFT 505	Food Biotechnology and Nutraceuticals
1	UGFT 501	Processing of Fruit and Vegetables

Semester VI

SR. NO	PAPER NO.	PAPER NAME
1	UGFT 601	Unit Operations in Food Industry
2	UGFT 602	Food Quality Assurance

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SEMESTER V

Sr. no	Paper no	Title	Theory/ Practical /Project	Total Marks	Distribution of Total Marks (100)	
					End Semester Theory	Internal Assessment
1	UGFT 501	Processing of fruits and Vegetables	Theory	100	60	40
2	UGFT 502	Physical properties of food	Theory	100	60	40
3	UGFT 503	Sensory evaluation of foods	Theory	100	60	40
4	UGFT 504	Food processing and Equipment	Theory	100	60	40
5	UGFT 505	Food Biotechnology and Nutraceuticals	Theory	100	60	40
6	UGFTP 501	Processing of fruits and Vegetables	Practical	50	-	-
7	UGFTP 502	Physical properties of food	Practical	50	-	-
8	UGFTP 503	Sensory evaluation of foods	Practical	50	-	-
9	UGFTP 504	Food processing and Equipment	Practical	50	-	-
10	UGFTP 505	Food Biotechnology and Nutraceuticals	Practical	50	-	-

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SEMESTER VI

Sr. No	Paper No	Title	Theory/ Practical/ Project	Total Marks	Distribution of Total Marks (100)	
					End Semester Theory	Internal Assessment
1	UGFT 601	Unit operations in Food industry	Theory	100	60	40
2	UGFT 602	Food quality Assurance	Theory	100	60	40
3	PAPER III	Internship / Training Project	-	150	-	-
4	PAPER IV			150	-	-
5	PAPER V			150	-	-
7	UGFTP 601	Unit operations in Food industry	Practical	50	-	-
8	UGFTP 602	Food quality Assurance	Practical	50	-	-

Paper III, Paper IV and Paper V - Internship/Training Project.

After completion of Paper, I & II, student has to complete internship equivalent to 60 lectures. The student has to produce relevant certificate and black book from the concerned industry. This internship will be of 10 credits.

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Credit Based Semester & Grading System

2019-20

SEMESTER V

Course code	Unit	Title	Credits	Lectures
UGFT 501		PROCESSING OF FRUIT AND VEGETABLES	3.4 Credits	25 Lectures
	1	Introduction: Composition and nutritive value of fruits and vegetables; Factors effecting composition source and receiving at processing plants, primary processing: cleaning, washing, peeling, slicing and blanching. Types of grading and used machines- Hand Grader, Flat screen grader. Types of sorter- cylinder separator, roller sorter, spiral sorter		
	2	Spoilage of fruits and vegetables: Different types of spoilages in fruits and vegetables. Spoilage during storage of fruits and vegetables and their prevention; General methods of preservation of whole fruits/vegetables and processed fruits and vegetables. spoilage of pickles - The methods of preparation, curing techniques, defects and remedies types of preservatives commonly used in fruits and vegetables processing industry, limits of usage of preservatives		
	3	Processing of fruits and vegetables: Dehydration of fruits and vegetables using various drying technologies like sun drying, solar drying (Natural and forced convection), osmotic, tunnel drying, fluidized bed drying, freeze drying, convectional and adiabatic drying; application to raisins, dried figs, vegetables, intermediate moisture fruits and vegetables. Fruits powder using spray drying. Technology of extraction of juices from different types of fruits		

	4	<p>Manufacture of fruits products: Manufacturing process of juice, soup, puree and paste; Jams, jellies and marmalade: selection, preparation, production. Differences between jam and jelly. Theory of jelly formation, failure and remedies in jam and jelly making.</p> <p>General Principles and manufacturing processes of preserves, candied fruits, glazed fruits, crystallized fruits. Criteria of Ready to Eat products</p>		
	5	<p>Manufacture of vegetables product: Manufacturing process of sauce, ketchup, vegetable juices and concentrated products</p>		
UGFT 502		PHYSICAL PROPERTIES OF FOOD	3.4 Credits	25 Lectures
	1	<p>Physical properties of foods Methods of estimation of – Shape –density, specific gravity- apparatus, porosity and surface area.</p>		
	2	<p>Thermal properties of food Definition and application of - specific heat, enthalpy, conductivity and diffusivity, Surface heat transfer coefficient.</p>		
	3	<p>Texture profile analysis and its application in food packaging and food product development: Texture of food - method of texture evaluation application in food packaging and food product development</p>		
	4	<p>Rheology in food application: Rheology – rheological classification – viscoelasticity – viscometers. Hookean body, St Venant body and Newtonian body.</p>		
	5	<p>Optical properties and mechanical damage: Optical property – importance and its application. Mechanical damage- causes of mechanical damage – methods for detection and evaluation of mechanical damage</p>		

UGFT 503		Sensory Evaluation of Food	3.4 Credits	25 Lectures
	1	Introduction: Definition of sensory evaluation, basic tastes, human senses and sensory perception, threshold, psychophysics, Tongue surface.		
	2	Arrangements for Sensory Evaluation Test control: Environment and taste room design; product control: sample preparation and presentation; Panelist controls; factors influencing measurements: psychological and physiological errors.		
	3	Statistical Methods for Sensory Evaluation: Classification of test methods; discrimination test: paired – comparison, duo-trio and triangle tests; affective test: qualitative (interview and focus group) and quantitative tests (paired preference and acceptance tests); Two sample test, ranking test, Two sample difference test, numeric scoring test, hedonic ranking test.		
	4	Subjective and objective methods: Texture analyzer – mechanical characteristics – chewiness, brittleness, and geometric characteristics, sensory panel- types – criteria for panel selection.		
	5	Application of Sensory Analysis in the Food industry: Quality control; storage stability testing; product development and consumer acceptance testing. Texture.		

UGFT 504		Food Processing and Equipment	3.4 Credits	25 Lectures
	1	<p>Thermal Processing:</p> <p>Mechanism of heat generation – High Pressure Processing; Concept – Equipment for HPP Treatment – Mechanism of Microbial inactivation and its application in food, dielectric heating of food; Pulsed electric heat field – equipment – Mechanism of PEF – Advantages, Ohmic heating of foods – Mechanism – Principle - Advantages, Applications. Irradiation – Principles – Types of irradiation – Advantage, Applications.</p>		
	2	<p>Non-Thermal Processing:</p> <p>Principle – Mechanism of Osmotic Dehydration – Effects of process parameters on mass transfer – Methods to increase the rate of mass transfer – Applications – Limitations of osmotic dehydration – Management of osmotic solutions. Minimal Processing – Principle – Methods – Advantages; Role of antimicrobial agents in food – Plant and animal derived antimicrobials – .Antimicrobial enzymes, Antimicrobial food packaging..HPP and gamma processing.</p>		
	3	<p>Heat exchangers, dryers and evaporators:</p> <p>Heat transfer equipments: Heat exchangers. Food evaporation equipments: food evaporators, evaporator components. Food dehydration equipments - Food dehydration principle, food dryers, hygiene and safety considerations. Types of dryers, Pumps, Types of Pumps and Boilers.</p>		
	4	<p>Food packaging equipment's:</p> <p>Introduction, preparation of food containers, filling equipment's, closing equipment's and group packaging.</p>		
	5	<p>Refrigeration:</p> <p>Refrigeration and freezing equipments. Refrigerants, freezers, chillers. Refrigeration cycle.</p>		

UGFT 505		Food Biotechnology and Nutraceuticals	3.4 Credits	25 Lectures
	1	Nutraceuticals: Nutraceuticals as a new dietary ingredient, Biological significance of nutraceuticals, World market for nutraceuticals, Regulatory issues, Health benefits, Antioxidants, Phytoestrogens, Isoflavonoids, Glucosinolates, Carotenoids, Omega-3 and omega-6 Fatty acids and Phytosteroids.		
	2	Probiotics, Prebiotics and Symbiotic: Definitions, Role and Usefulness in GIT health, Beneficial microbes, Prebiotics – Types – Effects on gut microbes; Resistant starch, FOS; Probiotics – Benefits; Symbiotics – Concept and role in management of GI diseases; Bioactive compounds.		
	3	Use of Biotechnology for food processing: Genetically modified foods – Need of GM foods, Challenges, Potential benefits in agriculture, Nutritional improvements, Animal foods Issues of concern and safety of GM foods and Food fortification.		
	4	Product based on infant food formula: Hydrolysate, formula for lactose intolerant infant, infant milk formula, Baby food based on cereals, weaning food, prebiotic and probiotic as infant food.		
	5	Nanotechnology: Introduction, Principle, Application of Nanotechnology in Food industry, Basic characterization techniques of nanomaterials		

References-

1. Girdharilal, Siddappaa, G.S and Tandon, G.L.1998. Preservation of fruits & Vegetables, ICAR, New Delhi.
2. W B Crusess.2004. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India.
3. Rao E. S. (2013). Food Quality Evaluation. Variety Books.
4. Meilgard (1999). Sensory Evaluation Techniques, 3rd ed. CRC Press LLC, 1999.
5. Brannen and et al., Food Additives, Marcel Dekker, New York,1990
6. Manay NS and Shadaksharaswamy M,1987, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi

T. Y. B. Voc. Food Technology
Credit Based Semester & Grading System

2019-20

SEMESTER VI

Course code	Unit	Title	Credits	Lectures
UGFT 601		Unit Operations in Food Industry	3.3 Credits	25
	1	Heat transfer in food processing: Modes of heat transfer – Conduction, Convection and Radiation – Heat exchanger – Plate heat exchanger – Tubular heat exchanger – Scraped surface heat exchanger		
	2	Introduction to Mechanical equipment's in food industry: Equipment's: Types, planning, factors affecting selection and purchase; Transport equipment's: Fluid food transport equipment, mechanical conveyors; Storage equipment's: Solid and liquid food storage equipment's; Processing equipment's: Size reduction, homogenization, mixing and foaming equipment's; Separation equipment's: Grading and sorting equipment's		
	3	Distillation, Crystallization and Separation: Simple distillation, flash distillation, steam distillation, fractional distillation. Crystallization- theory, Tank crystallizer and scrap surface crystallizer. Membrane technology – Process – Micro-filtration, ultrafiltration, nanofiltration and reverse osmosis – advantages – Equipment		
	4	Extraction and Extrusion: Sedimentation, Centrifugal Separation, and Mixing. Material Handling- Belt conveyor,		

		Screw conveyor, Bucket elevator, Pneumatic conveyor		
	5	Mechanical separation and Material handling: Sedimentation, Centrifugal Separation and Mixing. Material Handling- Beltconveyor, Screw conveyor, Bucket elevator, Pneumatic conveyor.		
UGFT 602		Food Quality Assurance	3.3 Credits	25
	1	Concept of Quality – Food Safety: Objectives, Importance and functions of quality control, Quality management systems in India, Sampling procedures and plans, Food Safety and Standards Act, 2006; Domestic regulations, Global Food safety Initiative, Various organizations dealing with Inspection, Traceability and Authentication, Certification and Quality Assurance-, BIS; Labeling Issues, International Food Standards.		
	2	Food Safety and Standard Authority of India (FSSAI), 2011 Schedule 1,2,3,4		
	3	Food Quality Systems: Quality Assurance, total quality management, GMP/ GHP, GLP, GAP, Sanitary and hygienic practices, HACCP, Quality manuals, Documentation and audits.		
	4	Food Quality Laws and Regulations: Indian and International Quality Systems and Standards like ISO and Food CODEX, Export Import Policy, Export Documentation, Laboratory Quality procedure and Assessment of laboratory performance, applications in different Food Industries, FSSC 22000, GRMS, CODEX, BRC and ISO		

	5	<p>Intellectual Property Rights:</p> <p>PR – Introduction, history in India, Laws related to IPR, Copyrights, Patent, Trademark, designs, geographical indications of food, World Intellectual Property Organization (WIPO),</p> <p>IPR – Introduction, history in India, Laws related to IPR, Copyrights, Patent, Trademark, designs, geographical indications of food, World Intellectual Property Organization (WIPO) commercialization of IPR, important websites.</p>		
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References-

1. R.P.Singh and D.R.Heldman, (2001), "Introduction to Food Engineering", 3rd ed., AcademicPress.
2. S.K.Sharma, S.J.Mulvaney and S.S.H.Rizvi, (2000), "Food Process Engineering: Theory and Laboratory Experiments", Wiley and SonsPublishers.
3. Earle RL (2013) "Unit Operations in Food Processing" Elsevier
4. Albert Ibarz and Gustavo V. Barbosa-Cánovas (2003) "Unit Operations in Food Engineering" CRC Press, Boca Raton, FL, USA.
5. Alli Inteaz, (2003), "Food Quality Assurance: Principles and Practices", CRC Press.
6. Vasconcellos J. Andres, (2003), "Quality Assurance for the Food Industry: A Practical Approach", CRC Press.

T.Y.B.Voc. Food Technology Practicals

Credit Based Semester & Grading System

2019- 2020

SEMESTER V

Course code	Title	Credits	Total
UGFTP 501	PROCESSING OF FRUIT AND VEGETABLES	2.6	40 Lectures
	<ol style="list-style-type: none">1. Study of graders and sorters used in food processing.2. Preparation of lemon squash.3. Study and preparation of strawberry jam.4. Preparation of processing of making garlic depth.5. Study of making of Jelly.6. Preparation of tomato ketchup and tomato puree		
UGFTP 502	PHYSICAL PROPERTIES OF FOOD	2.6	40 Lectures
	<ol style="list-style-type: none">1.Determination of the size,sphericity of grains or seeds.2.Study the density of food item.3.Study the porosity of agricultural material.4.Determination the colour of the fruits & vegetables.5Measurement of Hardness of the Food Product.6.Determination of Specific Gravity of agricultural material.		

UGFTP 503	SENSORY EVALUATION OF FOODS	2.6	40 Lectures
	<ol style="list-style-type: none"> 1. Sensory Evaluation Laboratory set up 2. Sensory Evaluation of Food Products–Hedonic Rating Test 3. Judging of Milk 4. To plan a set of Sensory evaluation tests for a particular product. 5. Sensory Evaluation of Food Products– Ranking Test 6. Difference Tests <ol style="list-style-type: none"> i) Simple paired comparison test ii) Multiple paired comparison test iii) Duo Trio Test iv) Triangle Test 		
UGFTP 504	FOOD PROCESSING AND ENGINEERING	2.6	40 Lectures
	<ol style="list-style-type: none"> 1. Comparison of conventional and microwave processing of food 2. Preservation of food by the process of freezing 3. Drying of food using Tray dryer 4. Preservation of food by canning (Fruit/Vegetable/meat) 5. Demonstration of preserving foods under cold vs. freezing process. 6. Minimal Processing of raw food. 		
UGFTP 505	FOOD BIOTECHNOLOGY AND NUTRACEUTICALS	2.6	40 Lectures
	<ol style="list-style-type: none"> 1. Introduction to ELISA 2. Demonstration for detection of GMO foods 3. Study of fermentation technology of alcoholic beverages 4. Technology of indigenous and oriental fermented food 5. Identification of various nutraceuticals and functional foods available in the market 6. Preparation and evaluation of probiotic/prebiotic foods Determination of total pectin in plant material 		

References-

1. Maynard A. Amerine, Rose Marie Pangborn, Edward B. Roessler, (2013), "Principles of Sensory Evaluation of Food", Elsevier Publications.
2. Olga Martin-Belloso, Robert Soliva Fortuny, (2010), "Advances in Fresh-Cut Fruits and Vegetables Processing". CRC Press.
3. M. Anandha Rao, (2010), "Rheology of Fluid and Semisolid Foods: Principles and Applications: Principles and Applications", Springer Science & Business Media Publishing.
4. Zeki Berk, (2008), "Food Process Engineering and Technology", Academic Press Publishers.

T.Y.B.Voc. Food Technology Practical's

Credit Based Semester & Grading System

2019-20

SEMESTER VI

Course code	Title	Credits	Total
UGFTP 601	UNIT OPERATIONS IN FOOD INDUSTRY	2.6	40 Lectures
	1. Study of Principle, working and demonstration of hammer mill and crushing roll. 2. Study of graders for grains. 3. Study of graders for fruits and vegetables. 4. Study of different material handling equipments. 5. Study of principle and working of spray dryer. 6. Study of centrifugal separation (centrifugal cream separation, centrifugal machine)		
UGFTP 602	FOOD QUALITY ASSURANCE	2.6	40 Lectures
	1. HACCP IN dairy processing. 2. Controlling Food Safety Hazards in Fruit and Vegetable Industry through HACCP. 3. FSMS plan development for bakery industry. 4. Food safety issues related to Ready to Eat food. 5. Quality control of packaged foods. 6. Good Manufacturing Practices (GMPs): general and specific codes, requirements and guidelines case study: milk processing		

References-

1. Utilization of By-Products and Treatment of Waste in the Food Industry
Editors: Oreopoulou, Vasso, Russ, Winfried (Eds.)

2. food Processing Waste Management: Treatment and Utilization Technology Hardcover – 1 Jan 2011 by V. K. Joshi, S. K. Sharma.
3. Handbook of Food and Beverage Fermentation Technology Y. H. Hui, Lisbeth Meunier-Goddik, Jytte Josephsen, Wai-Kit Nip, Peggy S. Stanfield CRC Press, 19-Mar-2004

Evaluation Pattern

The performance of the learners shall be evaluated into two components viz. by Internal Assessment with 40% marks in the first component and by conducting the Semester End Examinations with 60% marks as the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below: -

A) Internal Assessment – 40% 40 Marks

20 Marks mid-term Online Test (MCQ Based Questions)

20 Marks [Any Two activities of 10 marks each] Presentation/Group Discussion /Project/ Field visit / Subject related Individual activity

B) Semester End Examinations – 60% 60 Marks

Question Paper Pattern

Maximum Marks: 60

Questions to be Set: 03

Duration: 2 Hrs.

All Questions are Compulsory Carrying 20 Marks each.

Q:1	Answer the following (Any 4)	20 Marks
Q:2	Answer the following (Any 4)	20 Marks
Q:3	Answer the following. (Any 4)	20 Marks

Note: Full length question of 20 marks may be divided into four sub questions of each 5 marks.