



# SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)  
 Declared as Category 'A' University by MHRD, Govt. of India  
 Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119,  
 Tamilnadu. India.



## SATHYABAMA UNIVERSITY FACULTY OF MECHANICAL ENGINEERING

### Department of Mechanical Engineering

#### Minutes of Board of Studies Meeting held on 14<sup>th</sup> December 2016

The following members were present in the meeting:

1. Dr.L.Vijayaraghavan, Professor- IIT Madras - External Member
2. Er.James Michael Amulu, Director- SAP - External Member
3. Dr.A.Krishnamoorthy, Professor and Head- Mechanical Engineering - Internal Member
4. Mr.S.P.Venkatesan, Associate Professor- Mechanical Engineering - Internal Member
5. Mr.R.Devaraj, Associate Professor- Mechanical Engineering - Internal Member
6. Dr.G.Senthilkumar, Assistant Professor- Mechanical Engineering - Internal Member
7. Mr.M.Purusothaman, Assistant Professor- Mechanical Engineering - Internal Member
8. Mr.Abhishek Singh Chauhan, Alumni- Internal Member

At the outset, the Chair Person welcomed the members of BoS and placed the agenda for the deliberations of the members. The following deliberations were made as per the items of the circulated agenda.

#### **1. Agenda item 1 # Addition of new Course for Bachelors of Engineering– Mechanical Engineering**

The Head of the department highlighted the feedback from the Alumni for the incorporation of elective courses to focus on emerging technologies and the suggestions from Dr.L.Vijayaraghavan and Er.James Michael Amulu is to focus on Environmental Science and Engineering. Based on the feedback, Department proposed the following courses for the incorporation of the following courses.

##### **Course 1: Environmental Science and Engineering**

**Resolutions:** The BOS resolved to recommend for approval of the suggested courses for inclusion in B.E Mechanical Engineering Programme.

#### **2. Agenda Item 2# Skilling in professional domains to promote industry ready competency among learners- Necessary training programs to improve the domain knowledge.**

Head pointed the Training Programs offered by the Mechanical Engineering department such as Training on Measurements and Metrology, Training on Machining and Servicing and Hands on practice of Welding Technology

**Resolutions:** The BoS recommended the same to promote the industry ready competency among the students.



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**3. Agenda item 3# Any other points with the permission of Chair** -Academic flexibilities with extra credits acquired through either advanced study of same courses or with procuring additional credits from additional courses as per student's choice

Head of the Department asked the suggestion to the External BOS members for students undergoing specialization. They have suggested NPTEL courses can be selected for the specialization.

**Resolutions:** The BoS recommended that advanced courses/NPTEL courses and can be selected for the specialization. Also recommend that the students can opt these courses at the end of the third semester subject to the condition prescribed by the Board of Management time to time.

With the above discussion, the Head expressed his deep sense of gratitude to all members for an academic vibrant discussion on various matters. Since there was no other agenda, the meeting ended with the Vote of thanks to the Chair.

Member	Designation	Signature
Dr.L.Vijayaraghavan	Professor	
Er.James Michael Amulu	Director	
Dr.A.Krishnamoorthy	Professor and Head	
Dr.S.P.Venkatesan,	Associate Professor	
Mr.R.Devaraj	Associate Professor	
Dr.G.Senthilkumar	Assistant Professor	
Mr.M.Purusothaman	Assistant Professor	
Mr. Abhishek Singh Chauhan	Alumni- Internal Member	



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## Addition of new Course for 'Bachelors of Engineering- MechanicalEngineering'

SCH1101	ENVIRONMENTAL SCIENCE AND ENGINEERING (Common to Mech, M&P, Aero & Auto)	L	T	P	Credits	Total Marks
		3	0	0	3	100

### COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the importance of the Environment.
- CO2 - Identify the Environmental impact due to Human activities and Disaster Management.
- CO3 - Identify the prevention and control measures of various pollutions.
- CO4 - Identify the threats to biodiversity and the ways for Conservation of Biodiversity.
- CO5 - Understand the water stress problems and energy crisis in present era.
- CO6 - Understand the issues involved in enforcement of environmental legislation.

### UNIT 1 INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10 Hrs.

Definition, scope and importance, need for public awareness, forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, floods, drought, conflicts over water, dams-benefits and problems, mineral resources: use effects on forests and tribal people. water resources: use and over-utilization of surface and ground water, exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources: Case studies. Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification, role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles.

### UNIT 2 ECOSYSTEMS AND BIODIVERSITY 10 Hrs

Concept of an ecosystem, structure and function of an ecosystem - producers, consumers and decomposers - energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Introduction to biodiversity, definition: genetic, species and ecosystem diversity - biogeographical classification of India - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, biodiversity at global, national and local levels. India as a mega-diversity nation, hot- spots of biodiversity, threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, endangered and endemic species of India, conservation of biodiversity, in-situ and ex-situ conservation of biodiversity.

### UNIT 3 ENVIRONMENTAL POLLUTION 9 Hrs.

Definition - causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution(e) noise pollution (f) thermal pollution (g) nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, role of an individual in prevention of pollution, pollution case studies, disaster management: floods, earthquake, cyclone and landslides.



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## UNIT 4 SOCIAL ISSUES AND THE ENVIRONMENT

8 Hrs.

From unsustainable to sustainable development, urban problems related to energy, water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people; its problems and concerns, case studies, environmental ethics: issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Wasteland reclamation, consumerism and waste products – environment protection act: air (prevention and control of pollution) act - water (prevention and control of pollution) act, wildlife protection act; forest conservation act. Issues involved in enforcement of environmental legislation, Key initiatives of Rio declaration, Vienna convention, Kyotoprotocol, Johannesburg summit and public awareness.

## UNIT 5 HUMAN POPULATION AND THE ENVIRONMENT

8 Hrs.

Population growth, variation among nations, population explosion, family welfare programme, environment and human health, human rights, value education, HIV / AIDS, women and child welfare, role of information technology in environment and human health, case studies. Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain. Visit to a local polluted site-urban/rural/ industrial/agricultural-study of common plants, insects, birds-study of simple ecosystems, pond, river, hill slopes etc.

Max.45 Hrs.

### TEXT / REFERENCE BOOKS

1. Meenakshi.P, Elements of Environmental Science and Engineering, 1st Edition, Prentice Hall of India, New Delhi, 2009.
2. Ravikrishnan. A, Environmental Science & Engineering,3rd Edition, Sri Krishna Publications, Chennai, 2008.
3. Erach Bharucha, Text Book of Environmental Studies, 2nd Edition, University Press, Chennai, 2006
4. Wrigh.R.T & Nebel B.J, Environmental science-towards a sustainable future by Richard 8th edition, Prentice Hall of India, New Delhi, 2006.

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 2 Questions each from CO1-CO4, 1 question each from CO5 and CO6 – 20 Marks

No choice

PART B: 4 Questions each with internal choice from CO1-CO4, 1 question from CO5 and CO6 with internal choice, each carrying 16 marks 80 Marks





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**SATHYABAMA UNIVERSITY**  
**FACULTY OF MECHANICAL ENGINEERING**

**Department of Mechanical Engineering**

Minutes of Board of studies meeting held on 10<sup>th</sup> March 2016

The following members were present in the meeting:

1. Dr.L.Vijayaraghavan, Professor- IIT Madras - External Member
2. Er.James Michael Amulu, Director- SAP - External Member
3. Dr.A.Krishnamoorthy, Professor and Head- Mechanical Engineering - Internal Member
4. Mr.S.P.Venkatesan, Associate Professor- Mechanical Engineering - Internal Member
5. Mr.R.Devaraj, Associate Professor- Mechanical Engineering - Internal Member
6. Dr.G.Senthilkumar, Assistant Professor- Mechanical Engineering - Internal Member
7. Mr.M.Purusothaman, Assistant Professor- Mechanical Engineering - Internal Member
8. Mr.Abhishek Singh Chauhan, Alumni- Internal Member

At the outset, the Chair Person welcomed the members of BoS and placed the agenda for the deliberations of the members. The following deliberations were made as per the items of the circulated agenda.

**1.Agenda item # 1 Modifications in the syllabus**

During the discussion on Agenda #1, the Head of the Department proposed some modifications for the course “SPR1201 Material Technology” based on the inputs from the subject experts. The suggested changes are listed below:

Inclusion of the following topics in Unit I: Atomic Diffusion – Laws of diffusion – Factors affecting diffusion.

Inclusion of the following topics in Unit III: Full annealing – Stress relief – Recrystallization, Case hardening techniques - Carburizing, Nitriding, Cyaniding, Carbonitriding, Flame and Induction hardening.

Inclusion of the following topics in Unit V: Hardness Test – Rockwell, Brinell and Vicker’s test, Fatigue – Characteristics of Fatigue Failure –Crack propagation of fatigue cracks – mechanism of fatigue failures – factors affecting fatigue strength - Fatigue limit – Creep – creep mechanism – creep curve – variables affecting creep curve

**Resolutions:** The External BOS members reviewed the syllabus modifications for the course “SPR1201 Material Technology” proposed by the Head of the Department, and considered the revision made after analyzing the importance of these changes. Then the members approved for implementing the revised syllabus in curriculum from 2016-17 academic year onwards.

## **2. Agenda item # 2 Addition of new Course**

Based on the feedback from alumni, it was realized that there was need to include the fundamental course on Mechanical Engineering so that the students of Mechanical Engineering would get some orientation towards the program. Keeping this in mind, the internal BOS members proposed a course “Fundamentals of Mechanical Engineering”. The BoS external experts, Dr.L.Vijayaraghavan and Er.James Michael Amulu, also felt that it is a required course in the first year students, and they recommended to include the course from July 2016 onwards.

**Resolutions:** The BOS members approved the proposed course “Fundamentals of Mechanical Engineering” for adding in “B.E Mechanical Engineering” curriculum.

## **3. Agenda item #3 Skilling in professional domains to promote industry ready competency among learners. Necessary certification courses to improve the domain knowledge**

Realizing the importance of CAD packages, the internal members and the Alumni felt that the value added course can be arranged for students on drafting and modeling in order to improve the job opportunities in the Mechanical design field. The head of the department highlighted the importance of “Drafting and Modelling Packages”. Based on discussion, the BoS members suggested including the value added courses on drafting and modeling using Autocad and Creo Parametric.









**Resolutions:** The BoS recommended the suggested value added courses on drafting and modeling using Autocad and Creo Parametric to the students to promote the industry readiness and skill set.

## **4. Agenda item #4 any other points with the permission of Chair**

Academic flexibilities with extra credits acquired through either advanced study of same courses or with procuring additional credits from additional courses as per student’s choice

**Resolutions:** The BoS recommended that advanced courses/NPTEL courses and can be selected for the specialization with the above discussion.

With the above discussion, the Head expressed his deep sense of gratitude to all members for an academic vibrant discussion on various matters. Since there was no other agenda, the meeting ended with the Vote of thanks to the Chair.

Member	Designation	Signature
Dr.L.Vijayaraghavan	Professor	
Er.James Michael Amulu	Director	
Dr.A.Krishnamoorthy	Professor and Head	
Dr.S.P.Venkatesan,	Associate Professor	
Mr.R.Devaraj	Associate Professor	
Dr.G.Senthilkumar	Assistant Professor	
Mr.M.Purusothaman	Assistant Professor	
Mr. Abhishek Singh Chauhan	Alumni- Internal Member	



**Modifications proposed for SPR1201 Material Technology Course.**

SMEX1006	MATERIAL TECHNOLOGY (Common to Mech, M&P, Auto)	L	T	P	Credits	Total Marks
		3	0	0	3	100

**UNIT I INTRODUCTION****10 hrs.**

**Basic Principles:** Crystal structures – BCC –FCC –HCP –Methods to determine crystal structure – Atomic radius –APF – Allotropy –Solid solution – Intermetallic compounds

**Phase diagrams:** Solidification of metals, phase rules, construction of phase diagram, Isomorphous, eutectic diagram showing partial solid solubility, peritectic system. Non-equilibrium cooling of above types of alloys Equilibrium solid state reactions.

**UNIT II FERROUS AND NON-FERROUS ALLOYS****10 hrs.**

Fe-Fe<sub>3</sub>C diagram, Cooling Curves of pure Fe, Critical points in Fe – Fe<sub>3</sub>C equilibrium diagrams, Phase changes. Simple calculation of amount of phases. Plain carbon steels, Effect of alloying elements on steel, Alloy steel, IS designation of steels – classification of cast iron ,Properties and Uses Composition and uses of important aluminium based alloys, copper based alloys and Nickel based alloys.

**UNIT III HEAT TREATMENT OF STEEL****10 hrs.**

Non-equilibrium transformation of austenite – Annealing, Normalizing, spheroidizing, TTT diagram. Continuous cooling transformation diagram – Hardening and tempering, martempering, austempering – Hardenability and its determination – Surface hardening processes. Heat treatment of non-ferrous alloys –Age hardening, precipitation hardening

**UNIT IV POWDER METALLURGY****10 hrs.**

Introduction, Methods of production of metal powder – mixing – blending – compacting – sintering –hot pressing – secondary and finishing operations – Advantages and applications.

**UNIT V MECHANICAL PROPERTIES AND TESTING****10 hrs.**

Elastic and plastic deformation of metals – elastic effects – Deformation by slip Tensile test – Stress – strain curve for mild steel & brittle material, determination of yield, ultimate stresses, and percentage elongation- Impact tests. Ductile – Brittle transition – fatigue and creep Stress cycle for fatigue testing, endurance limit. Fatigue limit, S-N Curve, Creep Curve .Fracture: Ideal fracture, brittle fracture, Griffith's theory – fracture toughness, ductile failure cup and cone. Type of fracture. Fatigue failure, crack propagation.

**TEXT / REFERENCE BOOKS:**

1. Avener S.H, "Introduction to Physical Metallurgy", Second Edition, McGraw Hill, NY, 1990
2. Raghavan.V, "Material Science and Engineering", 5th Edition, Prentice Hall, 2005
3. Khurmi.R.S, SEDHA R.S, "Material Science", 4th Edition, S. Chand & Co., 2009
4. Dieter.G.E, "Mechanical Metallurgy", 3rd Edition, McGraw Hill, 1986

**UNIVERSITY EXAM QUESTION PAPER PATTERN**

Max Marks : 80

Exam Duration : 3 hrs.

PART A : 2 Questions from each unit, each carrying 2 marks

20 marks

PART B : **100% Theory**, 2 Questions from each unit with internal choice, each carrying 12 marks

SPR1201	MATERIAL TECHNOLOGY (Common to Mech, M&P & Auto)	L	T	P	Credits	Total Marks
		3	0	0	3	100

## COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Interpret the given binary phase diagram to quantify the relative fraction of phases and micro-structural development at different temperatures and compositions.
- CO2 - Select the suitable grade of ferrous materials for the given engineering application.
- CO3 - Select the suitable grade of non-ferrous alloys for given engineering application.
- CO4 - Recommend the appropriate heat treatment/ strengthening mechanism to obtain the desired material properties.
- CO5 - Prepare a detailed testing plan for evaluating the desired mechanical properties according to the ISO/ ASTM testing standards.
- CO6 - Provide suggestions to overcome the material failure after investigating the given material failure case study.

## UNIT 1 INTRODUCTION

9 Hrs.

Basic Principles: Crystal structure: BCC –FCC –HCP –Methods to determine crystal structure – Atomic radius – Atomic Packing Factor – Allotropy –Solid solutions, Intermetallic compounds, Atomic Diffusion – Laws of diffusion – Factors affecting diffusion. Phase diagrams: Solidification of metals, phase rules, construction of phase diagram, Isomorphous diagram, Eutectic diagram showing partial solid solubility, Peritectic system.

## UNIT 2 FERROUS ALLOYS

9 Hrs.

Iron – Iron carbide equilibrium diagram, Cooling Curves of pure Fe, Critical points in Fe – Fe<sub>3</sub>C equilibrium diagrams, Steels types of plain carbon steels, stainless steels – their typical compositions, properties and applications, effects of alloying elements on steel, IS designation of steels – Cast iron – grey cast iron, white cast iron, malleable cast iron, spheroidal graphite cast iron – their typical compositions, properties and applications

## UNIT 3 NON-FERROUS ALLOYS

9 Hrs.

Aluminium and its alloys, Copper & its alloys, Ti & its alloys, Nickel & its alloys – Composition, Properties & applications of these alloys

## UNIT 4 HEAT TREATMENT OF STEEL

9 Hrs.

Annealing – Full annealing – Stress relief – Recrystallization – Spheroidizing, Normalizing, Hardening, Tempering, Austempering, Martempering – Hardenability and its determination, TTT diagram and CCT diagram, Case hardening techniques - Carburizing, Nitriding, Cyaniding, Carbonitriding, Flame and Induction hardening, Age hardening, Precipitation hardening

## UNIT 5 MECHANICAL PROPERTIES AND TESTING

Elastic and plastic deformation of metals – Elastic effects – Deformation by slip, Tensile test – Stress – strain curve for mild steel & brittle material, Hardness Test – Rockwell, Brinell and Vicker's test, Impact test – Charpy and Izod Fatigue – Characteristics of Fatigue Failure – Crack propagation of fatigue cracks – mechanism of fatigue failures – factors affecting fatigue strength - Fatigue limit – Creep – creep mechanism – creep curve – variables affecting creep curve – Fracture – Type of Fracture – Ductile – Brittle – Griffith's theory, Fracture toughness

Max.45 Hrs.

## TEXT / REFERENCE BOOKS

1. Avener S.H, "Introduction to Physical Metallurgy", 2nd Edition, McGraw Hill, NY, 1997.
2. Raghavan V, "Material Science and Engineering", 5th Edition, Prentice Hall, 2005.
3. William D Callister "Material Science and Engineering", John Wiley and Sons 2007.
4. Khurmi.R.S, Sedha R.S, "Material Science", 4th Edition, S.Chand & Co., 2009.
5. Dieter.G.E, "Mechanical Metallurgy", 3rd Edition, McGraw Hill, 1988.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 2 Questions each from CO1-CO4, 1 question each from CO5 and 20 Marks

CO6 – No choice

PART B: 4 Questions each with internal choice from CO1-CO4, 1 question from CO5 and CO6 with internal choice, each carrying 16 marks 80 Marks

 - **Modifications proposed for SPR1201 Material Technology Course.**

## Addition of new Course for Bachelors of Engineering– MechanicalEngineering

<b>SME1102</b>	<b>FUNDAMENTALS OF MECHANICAL ENGINEERING (Common to Mech, M&amp;P &amp; Auto)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>

**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Choose the material for a specified application based on the material selection criteria.
- CO2 - Recommend the appropriate method for product development and design process of a given product.
- CO3 - Prepare the list and the sequence of manufacturing operations required to make a given product.
- CO4 - Suggest the right machines, production resources and tools required for machining a given product.
- CO5 - Choose the components required to achieve the particular IC engine specifications.
- CO6 - Propose the type of power plant suitable for a specific case based on the location, power demand, sustainability, cost, availability, capacity and pollution.

**UNIT 1 PRODUCT CYLCLE**

9 Hrs.

Need for new product development – Globalization – Product life cycle – Technology development cycle – Forward cycle – Forward engineering – Design process – Materials Used in Engineering and their Applications Metals – Ferrous and Non- Ferrous, Nonmetallic materials, Material selection criteria Design considerations Steps in Design, designing to codes and standards sequential engineering – simultaneous engineering – concurrent engineering – Reverse engineering – Re engineering.

**UNIT 2 MANUFACTURING PROCESS**

9 Hrs.

Introduction to manufacturing processes and Their Applications: Sheet metal forming, Sheet metal cutting, Fabrication, Metal joining processes. Principles of welding - fundamentals of arc welding, gas welding and gas cutting – brazing and soldering. Foundry – tools - patterns –moulding process – types – green sand moulding and dry sand molding, castings – sand casting – die casting – defects and remedies Forging - forging tools - open-die forging, closed-die forging, coining, nosing, upsetting, heading, - smithy tools

**UNIT 3 PRODUCTION PROCESS (MACHINE TOOLS)**

9 Hrs.

Metal machining process: Lathe -Specifications - Main components and their functions-Lathe operations. Machining Concept Drilling, Milling, Turning, Grinding and surface Finishing. Operations. Study of Pillar drilling machine, boring, milling, shaping, planing, broaching, grinding. Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.

**UNIT 4 I.C.ENGINES**

9 Hrs.

Working principle of S.I. and C.I.engines – four stroke and two stroke cycles – comparison of four stroke and two stroke engines, Ignition systems –single jet carburetor-spark plug-cooling systems- lubrication systems - fuel pump and fuel injector, function of piston, piston rings, cylinder, connecting rod and crankshaft. Steam Engine (Qualitative treatment only)

UNIT 5 POWER PLANT

9 Hrs.

Layout - components and working of Steam, Hydel, Diesel, Nuclear and Gas turbine Power Plants - comparison and selection of sites, High pressure and Super Critical Boilers – Fluidised Bed Boilers

Max.45 Hrs.

**TEXT / REFERENCE BOOKS**

1. George E.Dieter, Linda C.Schmidt, "Engineering Design", McGraw-Hill International Edition, 4th Edition, 2009, ISBN 978-007-127189-9
2. Hajra-Chaudhari "Workshop Technology"/
3. Ganesan V, "Internal Combustion Engines", Third Edition, Tata Mcgraw-Hill, 2011.
4. Arora S.C and Domkundwar S, "A Course in Power Plant Engineering", Dhanpat Rai, 2001.
5. Cagan, Jonathan; Vogel, Craig M.; Creating Breakthrough Products: Innovation from Product Planning to Program Approval, Publisher: Financial Times Prentice Hall; 2002
6. Collier J.G., and Hewitt G.F, "Introduction to Nuclear power", Hemisphere publishing, New York, 1987.
7. John B Heywood, "Internal Combustion Engine Fundamentals", Tata McGraw-Hill, 2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 2 Questions each from CO1-CO4, 1 question each from CO5 and CO6 – No choice

20 Marks

PART B: 4 Questions each with internal choice from CO1-CO4, 1 question from CO5 and CO6 with internal choice, each carrying 16 marks

80 Marks