I SEMESTER

<table>
<thead>
<tr>
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<th>Title</th>
<th>Teaching Dept</th>
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<th>Duration of SEE (Hrs)</th>
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<tbody>
<tr>
<td>15CCT 101</td>
<td>Quantitative Methods in Construction</td>
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LIST OF ELECTIVE I & II

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<tr>
<th>ELECTIVE-I</th>
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<tbody>
<tr>
<td>15CCT 111 Building Science</td>
<td>15CCT 121 Remedial Engineering</td>
</tr>
<tr>
<td>15CCT 112 Construction Methods in Disaster Prone Areas</td>
<td>15CCT 122 Pavement Design &amp; Construction</td>
</tr>
<tr>
<td>15CCT 113 Advanced Design of Foundations</td>
<td>15CCT 123 Soil Exploration &amp; Ground Improvement Techniques.</td>
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<tr>
<td>15CCT 114 Structural Masonry</td>
<td>15CCT 124 Computer Aided Design in Civil Engineering</td>
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<tr>
<td>15CCT 115 Design of Earthquake Resistant Structures.</td>
<td>15CCT 125 Advanced Reinforced Concrete Design</td>
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### II SEMESTER

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<td>Construction Economics &amp; Finance</td>
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<td>Construction Quality &amp; safety</td>
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### LIST OF ELECTIVE III & IV

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<tr>
<th>ELECTIVE-III</th>
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<tr>
<td>15CCT 213 Re-use &amp; Re-cycle Technology</td>
<td>15CCT 223 Valuation Techniques in Engineering</td>
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## M.TECH.CONSTRUCTION TECHNOLOGY
(AUTONOMOUS SCHEME 2015)
III SEMESTER

<table>
<thead>
<tr>
<th>Sub. code</th>
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<td>Practical/ Tutorials/Field work</td>
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<td>15CCT 301</td>
<td>Industrial Training / Mini Project</td>
<td>8 Weeks duration</td>
<td>50 (Report) 50(Presentation)</td>
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<td>15CCT 302</td>
<td>Seminar</td>
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<td>15CCT 303</td>
<td>Project Phase– I</td>
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<td>100 (Report) 100(Presentation)</td>
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**Note:**
1. 15CCT 301: Industrial training / Mini Project: Industrial training report and oral presentation are to be evaluated by the department for 50 marks each. If mini project is carried out it is evaluated for 100 marks by the Department Committee.
2. 15CCT 302– Seminar marks are evaluated by the Department Committee.
3. 15CCT 303 – Project Phase I: The student should give minimum of two progress seminars during the semester. The progress of the work is to be assessed by the Department Committee including the Guide, for 100 marks report and 100 marks presentation.
### M.TECH.CONSTRUCTION TECHNOLOGY
(AUTONOMOUS SCHEME 2015)
IV SEMESTER

<table>
<thead>
<tr>
<th>Sub. code</th>
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</tbody>
</table>

**Grand Total from 1<sup>st</sup> to 4<sup>th</sup> Semester: 100 credits**

**Note:**

1. 15CCT 401 – Project Phase II: The student should give minimum of three progress seminars and one Pre Synopsis seminar during the semester.
2. 15CCT 401 – Project Phase II: The student should give one Pre Synopsis seminar in front of the Committee consisting of Guide, Chairman BOE (PG) or his nominee and PG Coordinator during the semester. The student should get approval from the Committee to submit the report.
3. 15CCT 401 – Project Phase II: The project report valuation will be carried out separately by the guide and External examiner for 100 marks each. Viva- Voce will carry 200 marks and will be conducted by a Committee consisting of the following.
   a) Chairman BOE (PG) or his nominee.
   b) PG Coordinator.
   c) Guide.
   d) External Examiner.
FIRST SEMESTER M.TECH (CONSTRUCTION TECHNOLOGY)

15CCT101 QUANTITATIVE METHODS IN CONSTRUCTION

Sub. Code: 15CCT101
Hours/week: 04
Total hours: 52

CIE: 50 Marks
SEE: 50 Marks
Credits: 04
Exam. Hours: 03

UNIT-I
Averages and Dispersion: Data collection, presentation of data, measures of central tendencies, measures of dispersion and coefficient of variation.

UNIT-II
Probability Distributions and Sampling: Definition of probability, axioms of probability, conditional probability, Baye’s theorem, one dimensional random variable, expectation and variance, curve fitting-linear, non-linear and exponential, correlation and regression.

UNIT-III
Probability Distributions: Normal and exponential distributions, two dimensional random variables, marginal distributions, conditional distributions, expectation, covariance and correlation, moments, relation between raw and central moments, skewness, kurtosis and central limit theorem.

UNIT-IV

UNIT-V
Dynamic Programming: Introduction to dynamic programming, traveling salesman problem and simulation applied to construction.

Text Books

Reference Books
15CCT 102 CONSTRUCTION PLANNING AND CONTROL

Credits: 04
Sub Code : 15CCT 102
Hrs / Week : 04 + 02 (Field Work)
Total Hours : 52
CIE: 50
Exam Hours: 03
SEE: 50

UNIT 1
Project Organization, Formal and Informal organization, Organization structures, Bar chart, Milestone chart, Work Breakdown Structure, Cost breakdown structure. 10 Hours

UNIT 2
Network analysis, Activity and event, Fulkerson’s rule of numbering events, Activity start and finish times, Forward and backward pass, Different types of floats. 10 Hours

UNIT 3
CPM analysis, PERT analysis, Time estimates-Optimistic time, Pessimistic time, Most likely time, Scheduling, Monitoring and Updating. Line of Balance Scheduling. Resource Planning-leveling and Allocation. 10 Hours

UNIT 4
Project cost analysis, Time-Cost Trade-off. Cost Control in Construction, Linear programming-Graphical method, Theory of simplex method, Transportation models. 12 Hours

UNIT 5
Material Management- Scope, objectives and functions, Store management-Objectives and functions, Purchase management and inventory control management-Inventory control techniques, A B C analysis. 10 Hours

REFERENCE BOOKS
4. B.C Punmia, “Pert and CPM”, Lakshmi publication. (Pub)
15CCT 103 Advances in Construction Materials

Credits: 04
Sub Code : 15CCT 103                      CIE: 50
Hrs / Week : 04                             Exam Hours: 03
Total Hours : 52                            SEE: 50

UNIT 1
Microstructure of concrete, Fresh concrete and its rheology, Mechanical, deformational behaviour
of hardened concrete..                     10 Hours

UNIT 2
Creep and Shrinkage of Concrete. Proportioning of Mixes-Normal concrete. Problems on Concrete
mix proportioning.                         10 Hours

UNIT 3
High Strength/Performance Concrete, Roller Compacted Concrete, Self Compacting Concrete and
Reactive Powder Concrete – properties and applications. 12 Hours

UNIT 4
Polymer-concrete composites, Slurry infiltrated fibrous concrete (SIFCON), Slurry infiltrated mat
concrete (SIMCON) – properties and applications. 10 Hours

UNIT 5
Corrosion of Reinforcing Steel- Electro-chemical process, measures of protection. Adhesives and
sealants- properties, types and their uses. 10 Hours

REFERENCE BOOKS
   Materials”, (Indian Ed., Indian Concrete Institute), McGraw Hill.
4. Gambhir M.L “Concrete Technology”.

15CCT104 ORGANIZATIONAL BEHAVIOUR

Sub Code: 15CCT104                      CIE Marks: 50
Hrs/ Week: 04                             Exam Hours: 03
Total Hrs: 52                             SEE Marks: 50
Credits: 04

Objectives of the course:
1. To distinguish organizational behaviour and management as different yet related disciplines.
2. To describe issues related to organizational productivity and employee needs.
3. To explain the significance of various psychological traits of employees that systematically
   influences their behaviour on the job.
4. To describe the importance of organizational commitment and job involvement.

5. To understand the effects of economic insecurity on organizational commitment and job involvement.

UNIT 1
Approaches to Organizational Behaviour; Overview of the Field of Organization Development; Individuals in Organizations.

07 Hours

UNIT 2
Motivation and Behaviour; Motivation at work; Designing motivating jobs.

09 Hours

UNIT 3
Creating and individual decision making; Group Dynamics; Group behaviour, Inter-group relation and conflict.

12 Hours

UNIT 4
Communication; Leadership in Organizations; Characteristics of Organizations: Organization Structure and Design, Organizational Change and Development;

12 Hours

UNIT 5
Organizational Culture and climate. Managing Innovation and Technology in changing environments. Case studies of OD interventions in mega-construction projects.

12 Hours

TEXT BOOKS

REFERENCE BOOKS


15CCT115 DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

Subject Code : 15CCT115  
Credits : 04  
Hrs/ Week : 4-0-0  
Total Hours : 52

Objectives:
1. To give preliminary exposure to design of earthquake engineering
2. To improve analytical skill and problem solving abilities
3. To design some earthquake resistant structures

Expected outcome: At the end of the course students shall be able to:
1. Understand the basic principle of earthquake engineering
2. Ability to deal with practical problems in earthquake engineering

Pre-requisites of the course: CV103, CV402, CV501, CV502

UNIT 1
Introduction to engineering seismology, Seismic Waves, Characteristics of Earthquake and its quantification, Magnitude and Intensity, Seismic Instruments, Strong Ground Motions, Characteristics of Earthquakes, Attenuation of the Ground motion, History of Major Earthquakes in India  
10 Hrs

UNIT II
Seismic response of buildings, Study of response of buildings and structures due to past earthquakes, Complexity of Earthquake Ground Motion, introduction to structural dynamics-Damping in the dynamic system, concept of dynamic equilibrium, vibration of multi degree of freedom system, orthogonality of modes

Response Spectrum- elastic and elasto-plastic spectra, tripartite plot, use of response spectrum in earthquake resistant design  
12 Hrs

UNIT III
Earthquake analysis of multi-storied RC structure, discussion of IS code provisions of Earthquake resistant design of buildings. Analysis and design of RCC multistoried buildings by limit state method using static and dynamic method  
10 Hrs

UNIT IV
Structural configuration for earthquake resistant design frames, shear walls and dual systems, Seismic Resistant Structural Systems
Ductility and energy absorption in buildings, details of providing ductility in structures, lessons from structural damage during past earthquakes.  
10 Hrs
UNIT V

Concepts for Earthquake resistant masonry: lateral load analysis of masonry building, basis of flexibility of diaphragm, strength and material properties of masonry, Causes to failure of masonry structures and remedial measures taken to retrofit the structures, causes of damage in masonry building, poor performance of masonry building, Behavior of unreinforced and reinforced masonry wall, preparation of earthquake resistance of earthen building, in plane stiffness of wall with openings, Seismic behavior of masonry buildings during past earthquake, earthquake resistant design of masonry building- IS codal provisions.

10Hrs

TEXT BOOKS:


15CCT 122 PAVEMENT DESIGN AND CONSTRUCTION

Subject Code : 15CCT122
Credits : 04
Hrs/ Week : 4-0-0
Total Hours : 52

UNIT- I

INTRODUCTION: Highway and airport pavements, objects of pavement design, Types and component parts of pavements, their differences - Factors affecting design and performance of pavements. Factors affecting design and performance of flexible and rigid pavements.

8 hours

UNIT – II

ANALYSIS OF STRESSES IN FLEXIBLE PAVEMENTS: Stresses and deflections in homogeneous masses. Wheel load stresses, various factors in traffic wheel loads; ESWL and EWL factors.


12 hours

UNIT – III
STRESSES IN RIGID PAVEMENTS:
Factors affecting design and performance of pavements. Types of stresses and causes, factors influencing the stresses; general considerations in rigid pavement analysis, EWL, wheel load stresses, warping stresses, frictional stresses, combined stresses.

RIGID PAVEMENT DESIGN:

UNIT – IV

EQUIPMENT IN HIGHWAY CONSTRUCTION:
Various types of equipment for excavation, grading and compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

SUBGRADE:
Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests.

UNIT – V

FLEXIBLE PAVEMENTS:
Specifications of materials as per MORT&H, construction method and field control checks for various types of following flexible pavement layers – WMM- BM- SDBC-BC.

CEMENT CONCRETE PAVEMENTS:
Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints.

TEXT BOOKS:

REFERENCE BOOKS:
3. HRB/TRB/IRC/International Conference on “Structural Design of Asphalt pavements”.
14CCT 105 COMPONENT ASSESSMENT AND SOFTWARE APPLICATIONS LAB

Credits: 01
Sub Code : 14CCT 105
Hrs / Week : 03
Total Hours : 42
CIE: 50
Exam Hours: 03
SEE: 50

In-situ test methods: In situ testing of concrete structures, test methods available, planning of in situ tests, Surface hardness methods- Rebound Hammer equipment, its operation and procedure for testing, factors influencing rebound no, calibration, and interpretation of results, applications and limitations; Ultrasonic methods - UPV testing equipment, its use, different transducer arrangements, tests calibration and interpretation of results, Exposure to IS and other relevant codes

Stress-strain relationship of concrete and masonry: Mix design, casting and testing High Performance/strength Concrete cylinders and obtaining the stress-strain behavior (and modulus of elasticity) under compressive loading; casting and testing of stack bonded masonry prisms and obtaining the stress-strain behavior (and modulus of elasticity) under compression

Instrumentation for dynamic measurement: Use of vibration measuring instruments (accelerometers), data acquisition systems Experiments on SDOF systems – free-vibration tests to obtain natural frequency and damping Experiments on MDOF systems – free-vibration tests to obtain natural frequencies and mode shapes, use of spreadsheets to extract natural frequencies

Software Application: Use of Construction management software Analysis of skeletal and continuum structures using standard FEM packages

REFERENCE BOOKS
1. Relevant IS codes
2. Software manuals
SECOND SEMESTER M.TECH (CONSTRUCTION TECHNOLOGY)

15 CCT 201 CONSTRUCTION ECONOMICS AND FINANCE

Subject Code : 15CCT201
Credits : 04
Hrs/ Week : 4-0-0
Total Hours : 52

UNIT I
Break Even Analysis – Concepts of Contribution – Selling price – Variable cost – fixed cost – Profit Volume Ratio - determination of break even sales via BEP and PVR – determination of profit or loss in relation to breakeven point – advantages and application of breakeven analysis

10 hours

UNIT II

8 hours

UNIT III

12 hours

UNIT IV

10 hours

CIE: 50
Exam Hours: 03
SEE: 50
UNIT V

REFERENCE BOOKS

15CCT202 MECHANIZATION IN CONSTRUCTION

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<td>SEE:</td>
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</table>

UNIT I
Introduction to mechanisation, need for mechanization, standard and special equipments. Ownership cost and operating cost. Depreciation and methods of assessing depreciation costs.

UNIT II
Mechanization through construction equipments: earth excavation, moving and hauling. Productivity estimation and problems on same.

UNIT III
Aggregate manufacturing, Rebar fabrication, Concrete production and placement- types of equipment, process, production outputs and costs.

UNIT IV
Mechanisation through construction methods/technologies: segmental construction of bridges, box pushing technology for tunnelling, trench-less technology.

UNIT V
Formwork and scaffolding- types, materials and design principles. Precast/Prefab construction. Safety and Environmental issues in different equipment usages.
REFERENCE BOOKS:

15CCT203 CONSTRUCTION QUALITY & SAFETY

Sub Code: 15CCT203
Hrs/ Week: 04
Total Hrs: 52
Credits: 05

CIE Marks: 50
Exam Hours: 03
SEE Marks: 50

Objectives of the course:
1. To provide an insight into the basic concepts of Quality Management
2. To help students understand the tools and techniques to achieve quality.
3. An insight into the importance of TQM and its advantage for the organization
4. To introduce students to the Bench marketing and to make them understand the importance of the same in present scenario.

UNIT 1
Construction Quality, Inspection and Testing, Quality Control, Quality Assurance.
07 Hours

UNIT 2
Benchmarking, concepts of quality policy, standards, manual, third party certification.
09 Hours

UNIT 3
Total Quality Management, Critical Factors of TQM; TQM in Projects.
12 Hours

UNIT 4
Safety laws and standards. Safety Hazards and cost effectiveness.
Safety Management in Construction Industry- Safety rules in construction
12 Hours

UNIT 5
Equipment Reliability considerations. Safety Budgeting.
12 Hours
TEXT BOOKS
1. N. Logothetis, “Managing for Total Quality”, Prentice Hall.

REFERENCE BOOKS

15CCT 204 CONSTRUCTION AND CONTRACT MANAGEMENT

Credits: 04
Sub Code : 15CCT 204
Hrs / Week : 04
Total Hours : 52

CIE: 50
Exam Hours: 03
SEE: 50

UNIT I
- Ethics : definition of ethics , ethical principles , Ethics in Construction , unethical practices in construction , Professional and Engineering Ethics.
- Understanding the meaning of Estimation , budgeting and Budget control
- Concept of Building Cost Index number and how it is used in Rough or Preliminary Estimation.

10 Hours

UNIT II
- Detailed Estimation : Quantity Takeoff , BOQ
- Detailed Estimation : Costing : Broad Costing Philosophy : Direct cost , Indirect Cost and Other Cost parameters.
- Direct Cost : Components of Direct Cost : Labour , Materials , Plant and Machinery , other costs including all subcontracting items.
• Indirect Cost: Preliminaries, enabling works, Manpower Cost, Office establishment and running cost, Taxes, Risks, Escalation, other costs including Profit. Top Sheet
• Direct Cost: Labour: Estimation of Labour Cost, Labour Production rate or Productivity, Labour Emolument estimation and Direct Unit Cost of Labour for an activity or BOQ.
• Direct Cost: Materials: Estimation of Material Unit Basic Cost for a BOQ Element.
• Plant and Machinery: Estimation of Plant and Machinery Unit Basic Cost for a BOQ Element – P&M Productivity based on Time Cycle & Production rate analysis, Ownership charges / Rental Charges.
• Understanding how indirect costs are computed: Building Project, Road Project or any Infrastructure Projects
• Developing Top Sheet & getting Unit Total cost by Balanced Bid

12 hours

UNIT III

• Bidding Models: Concept of unbalanced bid using Front end loading, back end loading and quantity error exploitation methods. Merits and demerits of each method with applicability. Problems based on GATES model.
• Bidding strategies: Detailed concept about bidding strategies followed in a Contracting company, Principles of Competitive Bidding & Factors impacting bidding competition
• Types of Tender: Open competitive Bidding, Serial Tendering, selective tendering and negotiated tendering
• Tender or Bidding: general understanding about the meaning and process of tendering or bidding, different stages of Bidding, Prequalification and its Process, prequalification requirement, Bid Capacity – International competitive Bidding
• Bidding or Tender document or Form: understanding various elements of entire Tender document for an Item rate Tender under International Competitive bidding format. Other types of Tender forms followed in India: Government and Private.
• Complete process adopted in a contracting company for preparation and submission of tender. – item rate tender, EPC Tender, BOT Tender.
UNIT IV

- **Types of Contract** : All in contract or entire contract, Lump sum contract or Fixed Price Contract, Item rate or unit price contract, Percentage rate contract, Cost Plus Contract, Cost plus percentage rate contract, Cost plus fixed fee contract, Cost plus fluctuating fee contract, Target contract, The Schedule Contracts, Terms Contracts, Special variants EPC / BOT – Toll / Annuity / DBOT / DBFOT

- **Problems on** : Percentage rate contract, Cost Plus Contract, Cost plus percentage rate contract, Cost plus fixed fee contract, Cost plus fluctuating fee contract, Target contract.

- Contract Form or Condition’s of Contract : detailed discussion on various elements of Contract which needs to be included in contract form (based on FIDIC Red Book 1999 – Item rate tender only)

- Understanding about FIDIC & its Contract forms used for different types nature of work / contract.

- Brief Discussion about FIDIC Sliver Book : EPC Contracting : Various Contract Clauses Provision in Silver Book

UNIT V

- **Contract Management & Contract administration** : Detailed discussion about Process of Contract management and administration

- Extra work and Change order

- Claims and Claim management

- Disputes and Dispute resolution mechanism including Arbitration and reconciliation based on Arbitration and Conciliation Act 1996

REFERENCE BOOKS

1. Civil engineering Contracts and Estimates 3ed  B.S Patil
3. Contracts and their Management 3Ed , BS Ramaswamy
5. Construction and contract management practies 2ed , Dr V.K.Raina
6. Construction project management :2Ed , K.K. Chitkara
7. Roshan Namavathi, “Professional Practice”
14CCT 213 REUSE AND RECYCLE TECHNOLOGY

Credits: 04
Sub Code : 14CCT 213
Hrs / Week : 04
Total Hours : 52

UNIT I

10 Hours

UNIT II

12 hours

UNIT III

12 hours

UNIT IV
Waste Analysis: waste sampling, sampling mechanics, waste composition, waste properties, hazardous waste aspects, 

10 hour

UNIT V
Construction Demolition Wastes: Classifications, Reuse as fine aggregate, coarse aggregate, Properties of Construction Demolition Wastes, Properties of concrete products, Specifications, Standards, National Policy etc

8 hours

Reference books
3. Current Literature
UNIT I

Purpose of valuation, different forms of values, obsolescence, amortization, depreciation and its methods of determination using straight line, constant percentage, declining balance, sinking fund and sum of years method. Problems on valuation using Year’s Purchase, Capitalized value.  
09 Hours

UNIT II

Methods of valuation of open urban land, factors affecting intrinsic values of land, Comparative method, Abstractive method, Belting method. Problems on above methods. 10 hours

UNIT III

Outgoings- Municipal & Govt Taxes, insurance, Loss of rent, collection charges, annual repairs & maintenance. Problems on outgoings. Rent: definition, types of rent, problems on standard rent of buildings. Cost of structure-BIS rules for measuring plinth area and cubical contents. 10 hours

UNIT IV

Valuation of land with buildings-Rental method, Valuation by reference to profit, Direct comparisons of capital value, Residual or developmental method, valuation based on cost or contractor’s method. Leasehold properties and freehold Properties. Rights and Liabilities of Lessor & Lessee. Valuation of licensed premises. Problems on valuation of cinema and hotel. 11 hour

UNIT V

Easements- self imposed, legally created, Dominant and servient heritage- effect of easements on valuation. Market- Real Estate market and market value-fair market value, open market value-parameters affecting Investments- Bonds, debentures, capital gains, wealth Tax and Income Tax. Valuation on land acquisition. 12 hours
REFERENCE BOOKS:

1. Banerjee “Principles and Practice of valuation”.