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DCET 2027

📕 COMPLETE DCET FORMULA BOOKLET

All 5 Subjects — Every Formula, Shortcut & Memory Hack You Need | 100 Marks Coverage

📋 Table of Contents

1. Engineering Mathematics	20 Marks
2. Statistics & Analytics	20 Marks
3. IT Skills	20 Marks
4. FEEE (Electrical & Electronics)	20 Marks
5. Project Management Skills	20 Marks

📐 1. Engineering Mathematics — 20 MARKS

I. Matrices & Determinants (4 Marks)

- **Determinant (2×2):** $|A| = ad - bc$ for A = [[a,b],[c,d]]
- **Cramer's Rule (2 var):** $x = Dx/D,\ y = Dy/D$ where D = coefficient determinant
- **Adjoint (2×2):** $adj(A) = [[d,-b],[-c,a]]$ (swap diagonal, negate off-diagonal)
- **Inverse:** $A^{-1} = adj(A) / |A|$ (exists only if $|A| \neq 0$)
- **Singular Matrix:** $|A| = 0 \rightarrow$ No inverse exists
- **Characteristic Equation (2×2):** $\lambda^2 - (trace)\lambda + |A| = 0$

⚡ **Hack:** Eigenvalue sum = trace (diagonal sum), Eigenvalue product = $|A|$

II. Straight Lines (4 Marks)

- **Slope:** $m = (y_2 - y_1) / (x_2 - x_1)$
- **Slope-Intercept:** $y = mx + c$
- **Two-Point Form:** $(y-y_1)/(y_2-y_1) = (x-x_1)/(x_2-x_1)$
- **Intercept Form:** $x/a + y/b = 1$
- **Parallel Lines:** $m_1 = m_2$ | **Perpendicular Lines:** $m_1 \times m_2 = -1$
- **Angle between lines:** $\tan\theta = |m_1 - m_2| / (1 + m_1m_2)$

III. Trigonometry (4 Marks)

- **Radian ↔ Degree:** `π rad = 180°` → multiply by π/180 or 180/π
- **ASTC Rule:** All (I), Sin (II), Tan (III), Cos (IV) → which ratio is positive in each quadrant
- **Compound Angles:** `sin(A±B) = sinA·cosB ± cosA·sinB`

  `cos(A±B) = cosA·cosB ∓ sinA·sinB`
- **Double Angle:** `sin2A = 2sinA·cosA` `cos2A = cos²A − sin²A`

Hack (ASTC): "All Students Take Coffee" — remember which trig ratio is positive in Q1→Q4!

IV. Differential Calculus (4 Marks)

- **Power Rule:** `d/dx (xⁿ) = n·xⁿ⁻¹`
- **Product Rule:** `d/dx(uv) = u·v' + v·u'`
- **Quotient Rule:** `d/dx(u/v) = (v·u' − u·v') / v²`
- **Chain Rule:** `d/dx f(g(x)) = f'(g(x))·g'(x)`
- **Key:** d/dx(sinx)=cosx, d/dx(cosx)=−sinx, d/dx(e^x)=e^x, d/dx(ln x)=1/x
- **Maxima/Minima:** Set f'(x) = 0, then check f''(x): if <0 → maxima, if >0 → minima

V. Integral Calculus (4 Marks)

- **Power Rule:** `∫xⁿ dx = xⁿ⁺¹/(n+1) + C` (n ≠ −1)
- **Key Integrals:** ∫sinx dx = −cosx + C, ∫cosx dx = sinx + C, ∫e^x dx = e^x + C, ∫1/x dx = ln|x| + C
- **Definite Integral:** `∫ₐᵇ f(x) dx = F(b) − F(a)`
- **Area under curve:** `A = ∫ₐᵇ y dx`

📊 2. Statistics & Analytics 20 MARKS

I. Data Collection & Types (3 Marks)

Qualitative Data
Categories: Gender, Color, Yes/No (non-numeric)

Quantitative Data
Numeric: Discrete (countable) or Continuous (measurable)

Primary Data
Collected firsthand: Surveys, Interviews, Focus Groups

Secondary Data
Already exists: Books, Journals, Databases, Reports

II. Data Summarization & Visualization (6 Marks)

- **Frequency Table:** Tally marks → Class intervals → Frequency count
- **Relative Frequency:** `RF = f / Σf` (each class freq ÷ total)
- **Chart Types:** Bar (comparison) | Pie (proportion) | Line (trend) | Histogram (continuous) | Box Plot (spread)

Hack: Histogram has NO GAPS between bars (continuous data). Bar graph has GAPS (discrete categories)!

III. Measures of Location & Dispersion (5 Marks)

- **Mean:** $\bar{x} = \Sigma x / n$
- **Median:** Middle value (arrange in ascending order first!)
- **Mode:** Most repeated value | **Empirical:** $\text{Mode} = 3(\text{Median}) - 2(\text{Mean})$
- **Range:** $R = \text{Max} - \text{Min}$
- **Variance:** $\sigma^2 = \Sigma(x - \bar{x})^2 / n$ | **SD:** $\sigma = \sqrt{(\sigma^2)}$
- **Quartile Deviation:** $QD = (Q3 - Q1) / 2$

Hack: All identical values? SD = 0, Variance = 0. No calculation needed!

IV. Introduction to Python (6 Marks)

Data Types
int, float, str, bool, list, tuple, dict, set

If-Else
if condition: ... elif: ... else: ...

Loops
for i in range(n): ... | while condition: ...

Functions
def func_name(params): ... return value

💻 3. IT Skills 20 MARKS

I. Basics of Coding (4 Marks)

- **Algorithm:** Step-by-step procedure to solve a problem
- **Flowchart Symbols:** Oval (Start/End) | Rectangle (Process) | Diamond (Decision) | Parallelogram (I/O)

II. Web Development (4 Marks)

- **HTML5 Tags:** <h1-h6>, <p>, <a href>, <img src>, <table>, <form>, , /
- **CSS3 Types:** Inline (style="") | Internal (<style>) | External (.css file)
- **JavaScript:** Variables (var/let/const), Functions, Events (onclick, onload)

Hack: CSS priority: Inline > Internal > External. "Closer to element = Higher priority"

III. ERP & Business Process Automation (4 Marks)

- **ERP:** Integrates all business functions (HR, Finance, Sales, Inventory) into ONE system
- **Workflow Components:** Trigger → Task → Decision → Action → Notification

IV. Cloud & IoT (4 Marks)

Cloud Models
IaaS (infra) | PaaS (platform) | SaaS (software)

Cloud Types
Public | Private | Hybrid | Community

IoT Components
Sensors → Connectivity → Data Processing → UI

IoT Examples
Smart Home, Smart City, Smart Farming

Hack (Cloud): "Pizza as a Service" — IaaS = buy ingredients, PaaS = use oven, SaaS = order pizza!

V. Cyber Security (4 Marks)

Phishing
Fake emails/links to steal credentials

DoS Attack
Overwhelm server with requests → crash

Man-in-the-Middle

Firewall

Intercept communication between two parties	Monitors & filters incoming/outgoing network traffic

4. Fundamentals of Electrical & Electronics (FEEE) 20 MARKS

I. Electrical Safety (2 Marks)

- **Earthing Types:** Plate Earthing, Pipe Earthing, Rod Earthing
- **Safety Signs:** Prohibition (Red/Circle) | Warning (Yellow/Triangle) | Mandatory (Blue/Circle) | Safe (Green/Square)

II. Electrical Fundamentals (5 Marks)

- **Ohm's Law:** $V = I \times R$ | $I = V/R$ | $R = V/I$
- **Series Resistance:** $R_{total} = R_1 + R_2 + R_3 \ldots$
- **Parallel Resistance:** $1/R_{total} = 1/R_1 + 1/R_2 + 1/R_3 \ldots$
- **Power:** $P = V \times I = I^2R = V^2/R$ (Watts)
- **Energy:** $E = P \times t$ (kWh = Units) | 1 Unit = 1000W × 1hr
- **Power Factor:** $PF = \cos \varphi$ = Real Power / Apparent Power

Hack (Series vs Parallel): Series = "Same Current, Different Voltage" | Parallel = "Same Voltage, Different Current"

III. Protective Devices (3 Marks)

- **Fuse:** Weakest link, melts on overload | **MCB:** Automatic reset, trips on overload/short circuit
- **RCCB:** Protects against earth leakage | **ELCB:** Earth leakage circuit breaker

IV. Machines, Batteries & UPS (5 Marks)

- **Transformer Ratio:** $V_1/V_2 = N_1/N_2 = I_2/I_1$ (Turn ratio = Voltage ratio)
- **Step-Up:** $N_2 > N_1$ (increases voltage) | **Step-Down:** $N_2 < N_1$ (decreases voltage)
- **Battery Capacity:** Ah (Ampere-Hour) = Current × Time | **Efficiency = Output/Input × 100%**

V. Electronics & Digital (5 Marks)

- **PN Junction Diode:** Forward bias → conducts | Reverse bias → blocks
- **Resistor Color Code:** BBROY GBV GS W → 0-9

Logic Gates (Truth Tables)	Boolean Laws
AND: both 1→1 | OR: any 1→1 | NOT: inverts | NAND/NOR: universal gates	A+0=A | A·1=A | A+A'=1 | A·A'=0 | De Morgan's

Hack (Color Code): "BB ROY of Great Britain had Very Good Wife" = Black Brown Red Orange Yellow Green Blue Violet Grey White

5. Project Management Skills (PMS) 20 MARKS — EASIEST!

I. Introduction to Project Management (4 Marks)

- **Project:** Temporary, unique, has defined start/end, specific objective

- **Project vs Operations:** Project = Temporary & Unique | Operations = Ongoing & Repetitive
- **5 Process Groups:** Initiating → Planning → Executing → Monitoring & Controlling → Closing

> **Hack:** "I Plan Every Monday Carefully" = Initiating, Planning, Executing, Monitoring, Closing

II. Project Administration (4 Marks)

- **WBS:** Work Breakdown Structure — hierarchical decomposition of project into smaller tasks
- **PEP:** Project Execution Plan — roadmap for how project will be executed, monitored & controlled

III. Project Life Cycle (4 Marks)

- **4 Phases:** Planning → Execution → Monitoring → Closure
- **Risk Types:** Technical, Financial, Schedule, Resource, External
- **Risk Assessment:** Identify → Analyze → Prioritize → Mitigate → Monitor

IV. Planning & Scheduling (4 Marks)

- **Gantt Chart:** Horizontal bar chart showing tasks vs time (visual project schedule)
- **Milestone Chart:** Key events/deliverables marked on a timeline

V. CPM, Review & Audit (4 Marks)

- **CPM:** Critical Path Method — longest path through network = minimum project duration
- **Critical Path:** Zero float → any delay pushes project deadline
- **Crashing:** Add resources to critical activities to reduce project duration (increases cost)
- **Project Audit:** Independent review of project performance, compliance, and lessons learned

> **Hack:** PMS is 100% theory + conceptual. Read concepts twice, attempt 20+ MCQs = guaranteed 15+/20 marks!

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📞 +91 8971755960 | 🌐 adwitiyaacademyoflearning.com | 📍 Vijayanagar, Bengaluru