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CONTENTS OF PART - III

Sr. No.	Name & Author Name	Page No.
1	Evaluation of Analytical Skills of Students with Respect to Trait Emotional Intelligence Based on Information Technology Students Performance **N.Vidya Shreeram** **Dr. Muthukumaravel**	1-5
2	GSM Based Home Security **Bhumika Ajay Bhatt**	6-12
3	Augmented Reality: A Novel Way to Understand, Experience and Grasp **Mr. Ashwin D. Bhagat** **Ms. Cynthia Shinde**	13-21
4	Use of Social Media Networking & Computer Technology in Academic Libraries and Services in Modern Age **N. B. Thakare** **R. P. Bansode** **S.M. Ingole**	22-31
5	Green Computing: Green Data Center **Prof. Nishtha A. Kelkar** **Ms. Nidhi Akhilesh Pandey**	32-37
6	Python: The Imminent Future **Snehal Saurabh Rane**	38-45
7	A Study on Smart Citymodel Components Based on Internet of Thing **Trupti Deovrat Kulkarni**	46-50
8	Keyloggers: Monitoring and Security Web Activity in Workplace **Juita Tushar Raut** **Sayli Mandar Bhosale**	51-55
9	Android Based Mobile Application Development and its Security **Prof. Miss. Bhakti Narendra Raut**	56-65
10	Analysis of Network Topologies: An Innovative Approach **Ms. Gayatri S. Bakhtiani** **Mrs. Varsha N. Jadhav**	66-72
11	IoT Technology in Building Smart Cities **Ms. Janhavi Rajendra Raut**	73-77

CONTENTS OF PART - III

Sr. No.	Name & Author Name	Page No.
12	Multimedia Data Mining **Ms. Krutika H. Churi**	78-83
13	Green Computing "Eco-Friendly Technology" **Ms. Tejal R. Patil**	84-88
14	Green Computing-E-Waste Minimization **Vaishali Sindekar** **Yugandhara More**	89-93
15	Intellectual Properties **Mr.Raut Mrudul Ashok**	94-102
16	IOT based Smart Switches **Ms. Priyadharshini Thevar** **Mr. Shiba Prasad Kar**	103-107
17	Cyber Security - Problems and Solutions **Ms. Manali B. Churi** **Ms. Niyati S. Patil**	108-114
18	Cyber Pornography **Mr. Raut Mrudu`l Ashok**	115-119
19	Parallel Database System and Query Evaluation **Ms. Kajal Singh** **Ms. Manali Patil**	120-125
20	Strengthing of Cognitive Computing Technology for Students to Improve the Effectiveness in Education **Mrs. Priyanka Bangar** **Mrs. Dipika P. Vishe**	126-130
21	MA-NET is a New Pattern of Wireless Communication for the Performance of Mobile Hosts in the Network **Dr. Bhanu Pratap**	131-139
22	Big Data in Libraries: Challenges and Issues **Prof. Sheela K. Godbole** **Dr. Ramdas Lihitkar**	140-146

Volume - VI - Issue - II - February - July - 2018
GENIUS - ISSN - 2279 - 0489 - IMPACT FACTOR - 4.954 (www.sjifactor.com)

CONTENTS OF COMMERCE

Sr. No.	Name & Author Name	Page No.
23	CSR Ethics & Social Responsibility **Dr. Kiran J. Save**	147-150
24	Consumer Perceptions on Organic Food Products **Prof. Ajay Tekchandani**	151-159
25	Students' Perceptions Regarding SIM (Self Instructional Material) Books with Special Reference to MBA Programme of YCMOU **Dr. Surendra Patole**	160-165
26	A Review of Sustainable Farming in Palghar District **Mrs. Priya Jaiswal Chaurasiya**	166-169
27	Indian Constitution & Social Justice **Mr. Ramdas Yede**	170-176
28	Women Entrepreneurs: Emerging Human Resource in the 21st Century **Ms. Sailee Mhatre** **Mrs. Manasi N. Vaity**	177-185
29	A Study on Online Shopping Attitude with Special Reference to St. John Technical Campus - Palghar **Ms. Sandra D'Souza** **Ms. Sayli Dighe**	186-192

CONTENTS OF TECHNOLOGY

Sr. No.	Name & Author Name	Page No.
30	Digital India: Evolving with the Time **Divyanka Kiran Sankhe**	193-202
31	Security Issues Associated with Bigdata **Ms.Gunjan B. Agrawal** **Ms.Mokshita N. Shetty**	203-209
32	Analysis of TUNNEL Formwork System: Case Study of 'Rohan - Abhilasha **Mr. Mahendra B. Daima**	210-217
33	Internet of Things (IOT) in "Smart Cities" **Prof. Ranjeeta Kapoor** **Ms. Hemlata Prajapati**	218-222

14

Green Computing-E-Waste Minimization

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Abstract:

Green computing is the study and practice of using computing resources efficiently and eco-friendly. The goals are that is to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote recyclability or biodegradability of defunct products and factory waste. In recent years, companies in the computer industry have come to realize that going green is in their best interest, both in terms of public relations and reduced costs. This paper presents at several green initiatives currently under way in the computer industry, as well as issues that have been raised regarding these initiatives and presents a study about the green computing. Ultimately green computing focuses on ways in reducing overall environmental impact, its main purpose is to find and promote new ways of reducing pollution, discovering alternative technologies, and creating more recyclable products.

Keywords: E-waste, Environment, Green Computing, Eco-Friendly

Introduction:

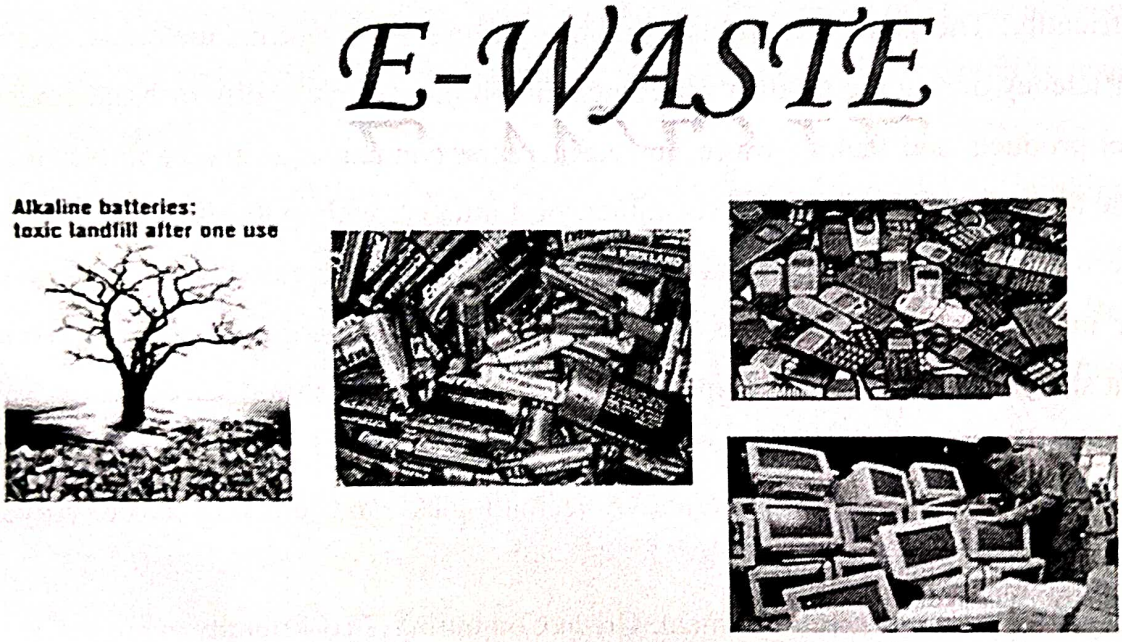
Green computing, or green IT, will improve the way computing devices are not only being used but the devices IT uses and how their infrastructure is designed. Businesses are "going green" in many areas, but specifically in IT because data centers and servers are the biggest offenders when it comes to IT inefficiency. We may have even heard the buzz around "green computing."

Many organizations today have an abundance of servers, and most of them are underutilized. Typically servers operate at 5%-20% of full processing capacity, but are still

using energy. Tack on the cost it takes to run hundreds if not thousands of desktop PCs everyday and power costs alone are putting dents in already tight IT budgets everywhere.

E-waste:

"E-waste" is a popular, informal name for electronic products nearing the end of their "useful life."E-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density. The hazardous content of these materials pose a threat to human health and environment. Discarded computers, televisions. VCRs. stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and groundwater.



Benefits of a Green IT Environment:

- **Reducing Environmental Impact:**

- Thin clients consume an average of 8-20 watts compared to an average of 150 watt per PC.
- Thin clients significantly lower a company's environmental footprint by reducing energy consumption and CO_2 emissions during use.

- **Financial Savings:**

- Cost savings from electricity can be reinvested.
- Thin client computing also lowers operating and administration costs.

➢ **Recycling:**

- Because thin clients have a longer life span and are in built in a significantly smaller form factor, they last longer and can be recycled.
- Thin Clients are RoHS(Restriction of Hazardous Substances) compliant. They meet the regulation regarding the restriction of the use of certain hazardous substances in electrical and electronic equipment.

More and more businesses are adopting green computing solutions for their IT environment. Switching to thin clients from PCs is one of the simplest and most effective ways to work towards a greener IT. Thin client provide a similar user experience but consume only a fraction of the energy required to run individual desktops.

E-Waste Minimization:

1. Shutdown and Turn Off- Reduce the amount of power used by a computer when it is not in use. This is easy to do but is often overlooked, but if done correctly it can amount to huge savings. Roughly one third of the electrical usage of an entire computer comes from the monitor. Use energy saving modes such as sleep, standby, or hibernate, to reduce the amount of power while away from the computer. Turn off the screensaver; it uses just as much energy as if the monitor were in use while using energy-saving modes reduces some power, it is better to turn off the monitor and shutdown the computer to completely eliminate

power usage. It is also important to switch the power off at the wall socket or unplug the device. A computer left on overnight for a year creates enough CO2 to fill a double-decker bus. Look for software that can help facilitate energy savings such as the Echo™ Thin Client Management Software that allows the administrator to program thin clients to shut down rather than go into "sleep" mode.

2. Virtualization- Virtualization includes separating the physical location of a thin or zero client devices from its logical interface. As applied to data centers, installing virtual infrastructure consolidates servers onto fewer pieces of hardware. It reduces overall energy use and cooling requirements and provides more computing power in less space. Thin clients consume an average of 8-20 watts compared to a 150 watt PC. With these measures, energy consumption can decrease by 80%. Every server that is virtualized saves 7,000 kWh of electricity and 4 tons of carbon dioxide emissions per year. Virtualization also increases IT capacity, improving server utilization rates from 5-15% to 60-80%. By running fewer, highly utilized servers, space and power can be saved.

3. Cloud computing- Cloud computing is where different services–such as servers, storage and applications–are accessed over the Internet. Companies that adopt cloud computing can decrease energy consumption, reduce carbon emissions and lower capital expenditure on IT resources while improving operational efficiency. Thin clients provide an entrance point into the cloud infrastructure while maintaining a secure connection and increasing manageability. Many studies reveal the great effects cloud computing has on the environment such as limiting resource allocation requirements, requiring less hardware and utilizing more of the server's power. The Carbon Disclosure Project estimates that by 2020, large US companies using cloud computing can achieve annual energy savings of $12.3 billion. A study conducted by Microsoft shows that companies that adopt cloud computing rather than running their own applications, can reduce energy use and carbon footprint of computing by up to 90% for smaller less efficient companies, and by 30% for large already efficient companies.

4. Reuse, Repurpose, Recycle- Computers are made from valuable resources and materials that require a lot of energy to mine and manufacture. In fact, the amount of fossil fuels and chemicals required in the manufacture of one desktop computer is over 9 times the weight of the computer. According to PC Stats, the average useful (capable of running

contemporary software) lifespan of a computer is 5 years. However, the Western Sustainability and Pollution Network (WSPPN) estimates that on average, Americans dispose their PC after only 30 months of use. Before deciding to discard a computer, make sure to consider all options. One alternative to buying a new computer is upgrading the hardware or software of the current computer or repurposing the current computer. Software such as VDI Blaster™, can provide a simple solution to transform a PC into a thin client, extending the capital investment of PCs. In the event a computer must be disposed, donate or recycle the computer to help conserve natural resources. Recycling one million laptops saves the energy equivalent to the electricity used by more than 3,500 US homes in a year.

Conclusion:

Reen computing minimizes the energy consumption of the organization i.e. minimizes the power bill. Use of non –toxic material in the equipments makes the worker safe from health problem and occupational hazards. It saves the resource of the country as a whole. In the long term these green equipment will be less costly without any hidden cost of waste and enhanced resource consumption without any detrimental effect of accuracy, performance and longevity. It is therefore concluded that appropriate legislation / regulations, user education & awareness and recycling are the solutions to reduce power consumption and minimize environmental waste.

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