MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

Estd. 2000

IQAC

MUST KNOW CONCEPTS

MKC

CSE

2020-2021

Course Code & Course Name : 19CSE01-Internet of Things

Year/Sem/Sec : II / IV / A

Subject		19CSE01-Internet of Things		
S.No	**Term**	**Notation (Symbol)**	**Concept/Definition/Meaning/Units/Equation/Expression**	**Units**
UNIT I : Introduction				
1	Internet of things	-	Network in which all physical objects are connected to the internet through network devices or routers and exchange data. Iot allows objects to be controlled remotely across existing network infrastructure.	-
2	Application of IOT	-	• Smart home • Wearables • Smart city • Smart grids • Connected car	-
3	IOT characteristics	-	• Intelligence • Connectivity • Dynamic nature • Enormous scale • Sensing • Heterogeneity	-
4	IOT advantages	-	• Communication • Automation and control • Information • Monitor • Automation of daily tasks leads to better monitoring of devices • Efficient and saves time	-
5	Disadvantages	-	• Compatibility • Complexity • Privacy/security • Safety	-

6	Four-layered architecture	-	Includes media/device layer, network layer, service and application support layer, and application layer.	-
7	Five-layered architecture	-	Includes perception layer, network layer, middleware layer, application layer, and business layer.	-
8	Internet gateway	-	The internet gateway receives the aggregated and digitized data and routes it over wi-fi, wired lans, or the internet, to stage 3 systems for further processing.	-
9	Sensors	-	Sensors collect data from the environment or object under measurement and turn it into useful data.	-
10	Data center	-	Data that needs more in-depth processing, and where feedback doesn't have to be immediate, gets forwarded to physical data center or cloud-based systems, where more powerful it systems can analyze, manage, and securely store the data	-
11	Design principles of iot	-	➢ Focus on value ➢ Take a holistic view ➢ Put safety first ➢ Consider the context ➢ Build a strong brand ➢ Prototype early and often ➢ Use data responsibly	-
12	Design considerations in an iot system	-	➢ Cost ➢ Network ➢ Features with an iot connected product ➢ User interface ➢ Power ➢ size of the device ➢ Antenna ➢ Cloud ➢ Interoperability ➢ Security	-
13	M2m technology	-	➢ Direct communication between machines ➢ Hardware based technology ➢ Do not necessarily rely on internet connection ➢ Normally communicates with a single machine at a time	-
14	Device management	-	An essential part of the iot and provides efficient means to perform many of the management tasks for devices such asdevice configuration,software upgrades, fault management	-
15	Developments in hardware and network technologies	-	➢ battery-powered devices with ultra-low power cellular connections ➢ devices that harvest energy from	-

			their environment ➢ smart bandwidth management and protocol switching ➢ multi-radio/multi-rate to switch between bands or bit rates	
16	The need for networking	-	The ability to exchange pieces of information using telecommunications technologies has changed the world, and will continue to do so for the foreseeable future, with applications emerging in nearly all contexts of contemporary and future living.	-
17	Local and wide area networking	-	Developments in hardware and network technologies ➢ battery-powered devices with ultra-low power cellular connections ➢ devices that harvest energy from their environment ➢ smart bandwidth management and protocol switching ➢ multi-radio/multi-rate to switch between bands or bit rates	-
18	Data management	-	Billions of devices interact and generate data at exponential growth rates, data management is of critical importance as it sets the basis upon which any other processes can rely and operate	-
19	Key characteristics of m2m data	-	Big data,heterogeneous data, real-world data, real-time data, temporal data, spatial data, polymorphic data, proprietary data, security and privacy data	-
20	Business processes in iot	-	With the prevalence of RFID, WSNS, and advanced networked embedded devices, all information exchange between the real-world and enterprise systems can be done automatically without any human intervention and at blazing speeds.	-
21	Everything as a service	-	Describes a general category of services related to cloud computing and remote access. It recognizes the vast number of products, tools, and technologies that are now delivered to users as a service over the internet.	-
22	M2M and iot analytics	-	Machine-to-machine communication is two machines “communicating,” or exchanging data, without human interfacing or interaction. This includes serial connection, powerline connection (PLC), or wireless communications in the industrial Internet of Things.	-
23	Knowledge management	-	Knowledge management is the concept of knowledge, which in every day usage	-

			relates to information, understanding, or skill you get from experience or education.within the context of iot solutions, information is data that has been contextualized, categorized, calculated, and condensed	
24	Three categories of risks	-	• Risks that are inherent in any Internet system, but that product/IoT designers may not be aware of • Specific risks that are unique to IoT devices • Safety to ensure no harm is caused by, for instance, misusing actuators	-
25	Device management	-	Maintain the list of device identities and map these into owners. It must also work with the identity and access management layer to manage access controls over device.	-
UNIT II: IoT Protocols				
26	View	-	A view is a representation of one or more structural aspects of an architecturethat illustrates how the architecture addresses one or more concerns held by one or more of its stakeholders.	-
27	Viewpoint	-	A viewpoint is a collection of patterns, templates, and conventions forconstructing one type of view. It defines the stakeholders whose concerns arereflected in the viewpoint and the guidelines, principles, and template models for constructing its views	-
28	Functional View	-	In a first step, the Unified Requirements are mapped to the different Functionality Groups of the IoT Functional Model.Next, clusters of requirements of similar functionality are formed and a Functional Component for these requirements defined.	-
29	IoT Process Management	-	Relates to the integration of traditional process management systems with the IoT. The overall aim is to provide the functional concepts and interfaces necessary to augment traditional (business) processes with the idiosyncrasies of the IoT world.	-
30	Two Functional Components in IoT Process Management	-	• Process Modelling; • Process Execution.	-
31	Process Modelling	-	The main function of the Process Modelling FC is to provide the tools necessary for modelling processes using the standardised notation, i.e. using novel modeling concepts specifically addressing	-

			the idiosyncrasies of the IoT ecosystem	
32	Process Execution	-	The Process Execution FC is responsible for deploying process models to the execution environments	-
33	Service Organisation	-	The Service Organisation FG (see Fig. 8.4) is the central Functional Group that acts as a communication hub between several other Functional Groups	-
34	Three Functional Components in Service Organisation	-	• Service Orchestration; • Service Composition; • Service Choreography.	-
35	Virtual Entity	-	The Virtual Entity FG contains functions for interacting with the IoT System on the basis of Virtual Entity, as well as functionalities for discovering and looking up services that can provide information about VEs, or which allow the interaction with virtual entities.	-
36	Functional Components in Virtual Entity	-	• VE Resolution; • VE &IoT Service Monitoring; • VE Service.	-
37	Communication Functional group	-	The Communication FG is an abstraction, modelling the variety of interaction schemes derived from the many technologies belonging to IoT systems and providing a common interface to the IoT Service.	-
38	Three functional components in Communication FG	-	The Communication FG consists of three functional components: • Hop To Hop Communication; • Network Communication; • End To End Communication.	-
39	Five functional components in security	-	• Authorisation; • Key Exchange & Management; • Trust & Reputation; • Identity Management; • Authentication.	-
40	Identity Management	-	The Identity Management FC addresses privacy questions by issuing andmanaging pseudonyms and accessory information to trusted subjects so that they can operate (use or provide services) anonymously.	-
41	Key Exchange and Management	-	The Key Exchange and Management (KEM) FC is involved to enable secure communications between two or more IoT-A peers that do not have initial knowledge of each other or whose interoperability is not guaranteed, ensuring integrity and confidentiality.	-

42	Information View	-	Information View focuses on the description, the handling and the life cycle of the information and the flow of information through the system and the components involved.	-
43	Push-pattern	-	The Push-pattern is a one-way communication between two parties in which a server sends data to a pre-defined client that receives the data.	-
44	Subscribe/Notify-pattern	-	The Subscribe/Notify-pattern allows an asynchronous way of communication between two parties without the client waiting for the server response.	-
45	IoT Service Resolution	-	The Functional Component IoT Service Resolution hosts the Service Descriptions that are needed for looking up and discovering IoT Services. Thus the resolution component offers methods to insert, update, and delete Service Descriptions	-
46	Deployment and Operation view	-	The Deployment and Operation view aims at providing users of the IoT Reference Model with a set of guidelines to drive them through the different design choices that they have to face while designing the actual implementation of their services	-
47	IoT Domain Model diagram	-	IoT Domain Model diagram is used as a guideline to describe the specific application domain and to this extent UML diagrams can be used to further detail the interaction among the many elements composing the target application;	-
48	Technologies that can be found in IoT systems	-	• Sensor & Actuator Networks; • RFIDs and smart tags; • WiFi or other unconstrained technologies; • Cellular networks.	-
49	Architectural perspective	-	An architectural perspective is a collection of activities, tactics, and guidelines that are used to ensure that a system exhibits a particular set of related quality properties that require consideration across a number of the system's architectural views.	-
50	Quality property	-	A quality property is an externally visible, non-functional property of a system such as performance, security, or scalability.	-
UNIT III : Web Of Things				
51	Internet of Things Vision	-	Through the exploitation of identification, data capture, processing and communication capabilities, the IoT makes full use of things to offer services to all	-

			kinds of applications, whilst ensuring that security and privacy requirements are fulfilled.	
52	IoT Ecosystem	-	IOT ecosystem comprises of users and stakeholders, IOT enabling technology, IOT viable marketplace.	-
53	Key Enabling Technologies	-	the Key Enabling Technologies (KET), of the High-Level Expert Group identified the enabling technologies, crucial to many of the existing and future value chains Nanotechnologies, Micro and Nano electronics, Biotechnology Advanced Materials, Advanced Manufacturing Systems	-
54	Multicom chips	-	The chips designed to accomplish integration of existing Wi-Fi networks into the mobile ecosystem	-
55	Internet of everything	-	The Internet is not only a network of computers, but it has evolved into a network of devices of all types and sizes, vehicles, smartphones, home appliances, toys, cameras, medical instruments and industrial systems, all connected, all communicating and sharing information all the time.	-
56	Strategic Research and Innovation Agenda	-	Strategic Research and Innovation Agenda (SRIA) is the result of a discussion involving the projects and stakeholders involved in the IERCactivities	-
57	The IERC vision	-	The IERC vision is that the major objectives for IoT are the creation of smart environments/spaces and self-aware things for climate, food, energy, mobility, digital society and health applications.	-
58	Vertical domains	-	Internet of Things Strategic Research Agenda (SRA) has identified and described the main Internet of Things applications, which span numerous applications are referred to as “vertical” domains: smart energy, smart health, smart buildings, smart transport, smart living.	-
59	Horizontal domain	-	The vision of a pervasive IoT requires the integration of the various vertical domains into a single, unified, horizontal domain which is often referred to as smart life.	-
60	IoT applications in Cities	-	• Intelligent Transportation Systems • Smart Lightning • Structural health • Smart Parking • Waste Management	-

61	IoT applications in Energy Smart Grid, Smart Metering	-	• Smart Grid • Photovoltaic Installations • Monitoring of water, oil and gas levels in storage tanks	-
62	IoT applications in Security & Emergencies	-	• Detection of gas levels and leakages in industrial environments • Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alert	-
63	IoT applications in Retail	-	• Supply Chain Control • NFC Payment • Intelligent ShoppingApplications • Smart Product Management	-
64	IoT applications in Industrial Control	-	• M2M Applications • Indoor Air Quality • Temperature Monitoring • Vehicle Auto-diagnosis	-
65	IoT applications in eHealth	-	• Fall Detection • Medical Fridges • Sportsmen Care • Patients Surveillance • Ultraviolet Radiation	-
66	Three important user categories from the IoT	-	• The individual citizens, • Community of citizens and • The enterprises.	-
67	Research challenges for smart city IoT applications	-	Low energy protocols and algorithms Algorithms for analysis and processing of data acquired in the city and making sense out of it. IOT large scale deployment and integration	-
68	Research challenges for Smart Energy	-	• Energy saving robust and reliable smart sensors/actuators • Technologies for data anonymity addressing privacy concerns • Dealing with critical latencies, e.g. in control loops • System partitioning (local/cloud based intelligence)	-
69	Smart Transportation and Mobility	-	The connection of vehicles to the Internet gives rise to a wealth of new possibilities and applications which bring new functionalities to the individuals and/or the making of transport easier and safer	-
70	Smart Factory and Smart Manufacturing	-	The role of the Internet of Things is becoming more prominent in enabling access to devices and machines, which in manufacturing systems, were hidden in well-designed silos.	-

71	Top M2M application that is available in the world	-	Asset tracking Insurance Telematics	-
72	Role of the network in Internet of Everything	-	Network itself plays an important role in the word of the Internet of Things, it is a driving factor for bringing all the different systems together which work hand in hand and show us a better future or betterment in every process	-
73	Important components that exist in the Internet of Things	-	The important components that exist in the Internet of Things are as follows: • Hardware • Software • Verbal exchange infrastructure	-
74	Layers of IoT protocol stack	-	Layers of IoT protocol stack are: 1) Sensing and information, 2) Network connectivity, 3) Information processing layer, 4) Application layer.	-
75	Mostly used sensors types in IoT	-	• Smoke sensor • Temperature sensors • Pressure sensor • Motion detection sensors • Gas sensor • Proximity sensor • IR sensors	-
UNIT IV : IoT Business Models				
76	European Research Cluster on the Internet of Things	-	The European Research Cluster on the Internet of Things has created a numberof activity chains to favour close cooperation between the projects addressingIoT topics and to form an arena for exchange of ideas and open dialog onimportant research challenges.	-
77	Activity chains	-	The activity chains are defined as work streams that group together partners or specific participants from partners around welldefined technical activities that will result into at least one output or delivery that will be used in addressing the IERC objectives.	-
78	IERC Activity Chain 05	-	IERC Activity Chain 05 isa cross-project activity focused on making a valued contribution to IoT privacy,security and governance among the EC funded research projects in the area ofInternet of Things.	-
79	Contribution From FP7 Projects	-	1. FP7 iCore Access Framework 2. IoT@WorkCapability Base Access	-

			Control System 3. GAMBAS Adaptive Middleware 4. IoT-A Architecture 5. Governance, Security andPrivacy in the Butler Project	
80	FP7 iCore Access Framework	-	The iCore cognitive framework is based on the principle that any real world object and any digital object that is available, accessible, observable or controllable can have a virtual representation in the "Internet of Things", which is called Virtual Object (VO).	-
81	Virtual objects	-	The virtual objects (VOs) are primarily targeted to the abstraction of technological heterogeneity and include semantic description of functionality that enables situation-aware selection and use of objects.	-
82	Composite virtual objects	-	Composite virtual objects (CVOs) use the services of virtual objects. A CVOis a cognitive mash-up of semantically interoperable VOs that renders servicesin accordance with the user/stakeholder perspectives and the application requirements.	-
83	Capability Based Access Control	-	Capability Based Access Control is devised according to the capability based authorization model in which a capability is a communicable, unforgeable token of authority.	-
84	Policy Decision Point	-	Policy Decision Point is a resource-agnostic service in charge of managing resource access request validation and decision. In the CapBAC environment it deals with the validation of the access rights granted in the capability against local policies and checking the revocation status of the capabilities in the delegation Chain	-
85	GAMBAS project	-	The GAMBAS project develops an innovative and adaptive middleware to enable the privacy-preserving and automated utilization of behaviour-driven services that adapt autonomously to the context of users.	-
86	IoT-A project	-	A set of requirements basedon the input of external and internal stakeholders was used as a basis for theidentification of the mechanisms and functionalities that guarantee user dataprivacy and integrity, user authentication, and trustworthiness of the system.	-

87	BUTLER project	-	The BUTLER platform must therefore be able to support different “Smart” domains, by providing them with communication, location and context awareness abilities, while guaranteeing their security and the privacy of the end users	-
88	SMARTIE	-	Secure and sMArterciTIEs data management	-
89	Vision of SMARTIE	-	The vision ofSMARTIEisto create a distributed framework for IoT based applications sharing large volumesof heterogeneous information.This framework is envisioned to enableend-to-end security and trust in information delivery for decision-making purposes and data owner’s privacy requirements.	-
90	New challenges identified for privacy, trust and reliability	-	• Providing trust and quality-of-information in shared information models to enable re-use across many applications. • Providing secure exchange of data between IoT devices and consumers of their information. • Providing protection mechanisms for vulnerable devices.	-
91	Risks to a Smart City IoT Platform	-	• Manipulate the sensor measurements to infiltrate the system withwrong data, e.g. to cause certain actuations • Attack the sensors and actuators physically to obtain credentials • Attack or impersonate network components to act as a man-in-themiddle • Obtain sensitive data or cause actuation by attacking the sharingplatform with forged or malicious requests	-
92	First Steps Towards a Secure Platform	-	Past and current projects, such as UbiSec&Sense,provide already some solutions on which a platform as outlined above can build which can be used as building blocks, but also components that need further development to be suitable for the type of platform SMARTIE aims for.	-
93	System of systems (SoS)	-	System of systems (SoS) is an entity composed of independent systems that are combinedtogether in order to interact and provide a given service, which cannot be provided by the individual systems when not cooperating.	-

94	Major properties of SoS	-	The major propertiesof SoS especially for application fields as those intended in the SMARTIEproject are dependability, security and privacy.	-
95	Dependability in system of system comprises	-	• Availability • Reliability • Safety • Integrity • Maintainability	-
96	Privacy-preserving Sharing of IoT Data	-	To the large extent, the IoT data may be of personal nature and therefore it isimportant to protect it from unauthorised entities accessing it. Privacy is oneof the most sensitive subjects in any discussion of IoT protection	-
97	Smart Transportation	-	Improving the management of the public transportation networksto foster greater use of sustainable transport modes and to providetime and cost benefits to travellers.	-
98	Smart campus	-	• Monitoring energy efficient in the campus considering energy consumption • and energy generation. • Evaluating real-time behaviour of systems jointly acting as a sustainableecosystem. • Providing the user capability to interact with the system to facilitatethe improvement of the energy efficiency.	-
99	Security and Privacy Challenges in Smart Transportation	-	Information related to location of public vehicles should be accessible to system users according to the access policy and privacy rules. All data exchange between the sensor, actuators and backend server should be implemented in a secure manner.	-
100	Security and Privacy Challenges in Smart campus	-	Access to the data of the sensor should be controlled based on access control and privacy rules. Hence only certain services of the entity monitoring could read or act over them especially in the case the monitoring entity is a third party.The exchange will require mechanisms including data protection and integrity in the transfer between the different parties.	-
UNIT V: Applications				
101	Value creation in iot	-	To start a project in industry environment the expected benefit, the expected value to the company has to be estimated and later needs to be re-evaluated and proved during operation.	-

102	Values	-	Value from visibility identification, location tracking Value form IoT-supported safety in hard industrial environments Value from reduced production losses Value from reduced energy consumption	-
103	Privacy of data in IOT	-	IOT is also having some disadvantages I.e privacy of data,security of object,Complexity in implementation and flexibility	-
104	Wearable Devices in IOT	-	Wearable electronic devices area unit little devices worn on the top, neck, arms ,torso, andfeet. Head–Helmets,Glasses Neck–Jewellery,collars Arm–Watches,Wristbands,rings Torso-clothing,backpacks Feet – socks, shoes	-
105	Keyfeatures of IoT	-	The mosts important feature of IoTinclude artificial Intelligence, Connectivity, sensors, active engagement and small device use.	-
106	IoT publishers	-	IoT Publishers are sensors that send real-time data to intermediate devices or middleware.	-
107	data collection in IoT	-	This software system manages sensing, measurements, light-weight information filtering, light-weight information security, and aggregation of knowledge.	-
108	common uses of IoT	-	IoT has applications across industries and markets. Engineering, business and Infrastructure Government and safety Home and workplace Health and drugs.	-
109	impact of the Internet of Things have on Healthcare sector	-	The biggest problem is providing quality healthcare service to every individual. With the help of the Internet of Things, a lot of smart devices and equipment have been designed to cater to this problem. The approach of Telemedicine and Telehealth is one of the biggest achievement	-
110	Different sectors where the Internet of Things can actually add value to the current processes	-	The Internet of Things process can be applied to any field where productivity, accuracy or process enhancement is needed. With the help of the technology and the smart hardware, all this can be executed in a fraction of the current operating cost.	-
111	Home automation components	-	▪ IoT Sensors ▪ IoT Gateways ▪ IoT Protocols ▪ IoT Firmware	-

			▪ IoT Cloud and Databases ▪ IoT Middleware-	
112	The biggest players in IoT cloud	-	The biggest players in IoT cloud can be divided into a platform as a service(PaaS) and infrastructure as a service(LaaS).	-
113	Three major parts in Home automation	-	Home automation has three major parts	-
114	Zigbee protocol	-	The Zigbee protocol is very important because it is known for its low power consumption, it maintained IEEE 802.15.4(2003) standards while utilization.	-
115	major drawback in the Internet of Things development and implementation	-	The availability of High-speed internet will be a major drawback in the Internet of Things development and implementation because it is one of the major requirement for the Internet of things to work efficiently and effectively	-
116	energy consumption issue when the Internet of Things is implemented	-	Internet of Things will take a lot of energy consumption and if that's the case the solution provided will not work as efficiently as possible.	-
117	difference between the Internet of Things and sensor businesses	-	A sensor business might not need an active internet connection and it can still work without it. But, when it comes to the Internet of Things it has a control side associated with it which is necessary to monitor, exchange the information from the sensor to the central unit within an active network.	-
118	IoT Cloud	-	IoT Cloud may be a platform for storing and process IoT information. It gathers information from devices, websites, applications, customers, and partners to trigger actions for period responses.	-
119	IoT Uses Company Names	-	Big names like Samsung, LG, Apple, Google and Philips are all working on connected devices, as are many smaller companies and startups.	-
120	Organization support	-	Almost all well-known companies are supporting to development of IoT applications in various application such that the companies are IBM, GOOGLE, AMAZON, GE, HONEYWELL, etc.	-
121	Pulse Width Modulation	-	PWM or Pulse Width Modulation is a variation of how much time the signal is high in an analog fashion. The signal can be high or low, and the user can even change the proportion of the time.	-
122	IoT in Government	-	IoT supports the event of sensible nations and sensible cities. This includes sweetening of infrastructure antecedently	-

			mentioned (e.g., healthcare, energy, transportation, etc.), defense, and conjointly the engineering and maintenance of communities.	
123	IoT in Transportation	-	At each layer of transportation, IoT provides improved communication, control, and knowledge distribution. These applications embrace personal vehicles, industrial vehicles, trains, UAVs, and alternative instrumentation. It extends throughout the complete system of all transportation parts like control, parking, fuel consumption, and more.	-
124	IoT Used protocols	-	• XMPP • AMQP • Very Simple Control Protocol (VSCP) • Data Distribution Service (DDS) • MQTT protocol • WiFi • Simple Text Oriented Messaging Protocol(STOMP) • Zigbee	-
125	databases for IoT	-	• influx DB • Apache Cassandra • RethinkDB • MongoDB • Sqlite	-
Placement Questions				
126	The average of 2, 7, 6 and x is 5 and the average of 18, 1, 6, x and y is 10. What is the value of y?	-	We have : (2+7+6+x)/4 = 5 or 15+x =20 or x = 5 Also (18+1+6+x+y)/5 = 10, 25+5+y = 50, y =20	-
127	How many 1/8s are there in $37\ ^{1}/_{2}$?	-	Required number = (75/2 x 8/1) = 300.	-
128	Look at this series: 22, 21, 23, 22, 24, 23, ….	-	In this simple alternating subtraction and addition series; 1 is subtracted, then 2 is added, and so on.	-
129	Look at this series: 53, 53, 40, 40, 27, 27, ...	-	In this series, each number is repeated, then 13 is subtracted to arrive at the next number.	-
130	Look at this series: 1.5, 2.3, 3.1, 3.9, ...	-	In this simple addition series, each number increases by 0.8.	-

131	When simplified, the product (1 – 1/2) (1 – 1/3) (1 – 1/4)…… (1 – 1/n) gives:	-	Exp: 1/2 x 2/3 x 3/4 x …..x (n – 1)/n = 1/n	-
132	Look at this series: 7, 10, 8, 11, 9, 12, ...	-	This is a simple alternating addition and subtraction series. In the first pattern, 3 is added; in the second, 2 is subtracted.	-
133	In a 1000 m race Usha beats Shiny by 50 m. In the same race, by what time margin Shiny beat Mercy who runs at 4 m/s ?	-	Speed of Shiny = 50/ 10 = 5m/s Time taken by shiny to complete the race is B = 1000/5 = 200 sec. Time taken by usha to complete the race is D = 1000/4 = 250 sec. Hence, D-B = 50 sec	-
134	$(112 \times 5^4) = ?$	-	$(112 \times 5^4) = 112 \times (10)4 = 112 \times 10^4 = 1120000 = 7000022^4 16$	-
135	It was Sunday on Jan 1, 2006. The day of the week Jan 1, 2010 is	-	On 31st December, 2005 it was Saturday. Number of odd days from the year 2006 to the year 2009 = (1 + 1 + 2 + 1) = 5 days. ∴ On 31st December 2009, it was Thursday. Thus, on 1st Jan, 2010 it is Friday.	-
136	The average of 2, 7, 6 and x is 5 and the average of 18, 1, 6, x and y is 10. What is the value of y?	-	We have : (2+7+6+x)/4 = 5 or 15+x =20 or x = 5 Also (18+1+6+x+y)/5 = 10, 25+5+y = 50, y =20	-
137	Today is Monday. After 61 days, it will be:	-	Each day of the week is repeated after 7 days. So, after 63 days, it will be Monday. ∴ After 61 days, it will be Saturday.	-
138	10 litres of water is added to 50 litres of a solution containing 20% of alcohol in water . What is the strength of alcohol in the solution now ?	-	Quantity of alcohol in 50 litres = 50*20/100 =10 strength in 60 litre solution = 10/60*100 = 100/6 = $16\ ^2/_3$	-
139	The days inx weeks x days?	-	x weeks x days = (7x + x) days = 8x days.	-

140	On 8th Feb, 2005 it was Tuesday. The day of the week on 8th Feb, 2004 is	-	The year 2004 is a leap year. It has 2 odd days. ∴ The day on 8th Feb, 2004 is 2 days before the day on 8th Feb, 2005. Hence, this day is Sunday.	-
141	The greatest number that will divide 43, 91 and 183 so as to leave the same remainder in each case.	-	Required number = H.C.F. of (91 - 43), (183 - 91) and (183 - 43) = H.C.F. of 48, 92 and 140 = 4.	-
142	The H.C.F. of two numbers is 23 and the other two factors of their L.C.M. are 13 and 14. The larger of the two numbers is:	-	Clearly, the numbers are (23 x 13) and (23 x 14). ∴ Larger number = (23 x 14) = 322	-
143	$(112 \times 5^4) = ?$	-	$(112 \times 5^4) = 112 \times (10)4 = 112 \times 10^4 = 1120000 = 7000022^4 16$	-
144	It was Sunday on Jan 1, 2006.The day of the week Jan 1, 2010 is	-	On 31st December, 2005 it was Saturday. Number of odd days from the year 2006 to the year 2009 = (1 + 1 + 2 + 1) = 5 days. ∴ On 31st December 2009, it was Thursday. Thus, on 1st Jan, 2010 it is Friday.	-
145	Today is Monday. After 61 days, it will be:	-	Each day of the week is repeated after 7 days. So, after 63 days, it will be Monday. ∴ After 61 days, it will be Saturday.	-
146	If 6th March, 2005 is Monday, The day of the week on 6th March, 2004 is	-	The year 2004 is a leap year. So, it has 2 odd days. But, Feb 2004 not included because we are calculating from March 2004 to March 2005. So it has 1 odd day only. ∴ The day on 6th March, 2005 will be 1 day beyond the day on 6th March, 2004. Given that, 6th March, 2005 is Monday. ∴ 6th March, 2004 is Sunday (1 day before to 6th March, 2005).	-
147	The days in x weeks x days?	-	x weeks x days = (7x + x) days = 8x days.	-

148	On 8th Feb, 2005 it was Tuesday. The day of the week on 8th Feb, 2004 is	-	The year 2004 is a leap year. It has 2 odd days. ∴ The day on 8th Feb, 2004 is 2 days before the day on 8th Feb, 2005. Hence, this day is Sunday.	-
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150	The H.C.F. of two numbers is 23 and the other two factors of their L.C.M. are 13 and 14. The larger of the two numbers is:	-	Clearly, the numbers are (23 x 13) and (23 x 14). ∴ Larger number = (23 x 14) = 322	-

Faculty Team Prepared **Signatures**

1.Dr.J.Preetha

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HoD