**JERUSALEMCOLLEGEOFENGINEERING**

**(AnAutonomousInstitution)**

**(ApprovedbyAICTE,AffiliatedtoAnnaUniversity,AccreditedbyNBAandNAACwith‘A’Grade**)

VelacheryMainRoad,Narayanapuram,Pallikaranai,Chennai-600100



JIT1601 –INTERNET OF THINGS

 Question Bank

**ACADEMIC YEAR: 2022 - 2023**

**EVEN SEMESTER**

**III YEAR / VI SEMREGULATION:2019**

**DEPARTMENT OFINFORMATIONTECHNOLOGY**

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**VISIONOFTHEDEPARTMENT**

Department of Information Technology strives to provide quality education, academicexcellencebasedon ethicalandsocietalvalues,exposingstudentstoallconcepts,soastopromoteglobalcompetitivenessinhighereducation,multi-disciplinaryresearchandentrepreneurship.

**MISSIONOFTHEDEPARTMENT**

* Toattainacademicexcellencethroughinnovativepracticesinteachingandresearchmetho-dologies.
* Toproducegloballycompetent informationtechnologistsandentrepreneurs.
* Tomotivatestudentstopursuehighereducationinterlacedwithcommunicationskills leadingtolifelonglearningandsocietaltransformations.
* Toprovideexcellenceinmulti-disciplinaryresearchanddevelopmentactivities rootedineth-icalandmoralvalues.

**PROGRAMMEEDUCATIONALOBJECTIVES(PEOs)**

**PEO1:** To ensure graduates will be proficient in utilizing the fundamental knowledge of basicsciences,mathematicsandInformationTechnologyfortheapplicationsrelevanttovariousstreams ofEngineeringandTechnology.

**PEO2:** To enrich graduates with the core competencies necessary for applying knowledge ofcomputers and telecommunications equipment to store, retrieve, transmit, manipulate and analyzedatainthecontextofbusinessenterprise.

**PEO3:** To enable graduates to think logically, pursue lifelong learning and will have the capacitytounderstand technicalissuesrelatedtocomputingsystemsandtodesignoptimalsolutions.

**PEO4:** To enable graduates to develop hardware and software systems by understanding theimportanceofsocial,businessandenvironmentalneedsinthehumancontext.

**PEO5:** To enable graduates to gain employment in organizations and establish themselves asprofessionalsbyapplyingtheirtechnicalskillstosolverealworldproblemsandmeetthediversifiedneeds ofindustry,academiaandresearch.

**PROGRAMSPECIFICOBJECTIVES(PSOs)**

**PSO-I:** Proficiency to effectively integrate IT-based solutions for contemporary cross-functionalapplications.

**PSO-II:** Ability to analyze, design, implement and evaluate the information systems with ethics,to meetthelocalandglobalrequirementsforscientificandindustrysolutions.

**QUESTIONBANK**

**SUBJECT :JIT1601 –INTERNETOF THINGS**

**SEM/ YEAR :VII - Final year**

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| **UNITIFUNDAMENTALS OF IoT** |
| EvolutionofInternetofThings-EnablingTechnologies–IoTArchitectures:oneM2M,IoTWorldForum(IoTWF)andAlternativeIoTmodels–SimplifiedIoTArchitectureandCoreIoTFunctionalStack-–Fog,EdgeandCloudinIoT–FunctionalblocksofanIoTecosystem–Sensors,Actuators,SmartObjectsandConnectingSmart Objects. |
| **PARTA** |
| **Q.NO** | **QUESTIONS** | **COMPETENCE** | **LEVEL** |
| 1. | **Define** IoT. | Remember | BTL-1 |
| 2. | **Give**theevolutionaryphasesof IoT. | Understand | BTL-2 |
| 3. | **Pointout**the challengesfacedby Internet of Things. | Analyze | BTL-4 |
| 4. | **Summarize** thecharacteristicsofIoT. | Evaluate | BTL-5 |
| 5. | **List** theapplications ofIoT. | Remember | BTL-1 |
| 6. | **Illustrate**theIoTReferencemodel. | Apply | BTL-3 |
| 7. | **Define** FogComputing. | Remember | BTL-1 |
| 8. | **Examine**the hierarchyofFog, Edge and Cloud. | Remember | BTL-1 |
| 9. | **Summarize**thecriteriausedtoclassifyActuators. | Evaluate | BTL-5 |
| 10. | Quotethetrends insmart Objects. | Remember | BTL-1 |
| 11. | **Differentiate**IoTandM2M. | Understand | BTL-2 |
| 12. | **Give**IoT Data Management and Compute Stack. | Understand | BTL-2 |
| 13. | **Classify**thefunctionalBlock ofIoTecosystem. | Apply | BTL-3 |

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| 14. | **Generalize** the“things”in IoT. | Create | BTL-6 |
| 15. | **Compare** Fog and Edge computing. | Analyze | BTL-4 |
| 16. | **Analyze**thepurposeof Sensors,Actuatorsand SmartObjects. | Analyze | BTL-4 |
| 17. | **List** the functionalstackofcore IoT. | Remember | BTL-1 |
| 18. | **Summarize** thecharacteristicsofFogComputing. | Understand | BTL-2 |
| 19. | **Classify**the differenttypes of Sensors. | Apply | BTL-3 |
| 20. | **Formulate**thecommunicationcriteriausedforconnectingsmartobjects. | Create | BTL-6 |
| **PARTB** |
| 1. | **Describe**theIoTenablingTechnologieswithsuitableexplanations. | Understand | BTL-2 |
| 2. | **Illustrate**theoneM2MIoTstandardizedarchitectureandexplainthelayerswithneatdiagram | Apply | BTL-3 |
| 3. | **Analyze**indetailtheHierarchyfollowedinEdge,FogandCloudwithsuitableillustration. | Analyze | BTL-4 |
| 4. | 1. **List**the“things”inIoTandexplainbriefly. (6)
2. **Describe**theprocessofConnectingSmartObjects.(7)
 | Remember | BTL-1 |
| 5. | **Formulate**theevolutionary trendofIoTwithnecessary illustration | Create | BTL-6 |
| 6. | **Summarize** indetailIoTdatamanagementandComputestack. | understand | BTL-2 |
| 7. | 1. **Tabulate**theAlternative IoTReference Models.(6)
2. **Describe**thesimplifiedIoTArchitecture.(7)
 | Remember | BTL-1 |
| 8. | 1. **Analyze** indetailaboutSensors,ActuatorsandSmartObjects.(6)
2. **Pointout**theCommunicationcriteriaandAccessTechnologiesforconnectingsmart Objects.(7)
 | Analyze | BTL-4 |
| 9. | **Describe**thesevenlayersofIoTReferencemodeldesignedbyIoTWF. | Remember | BTL-1 |
| 10. | **Demonstrate**theSimplifiedIoTArchitectureandCoreIoTFunctionalStackwith neat diagram. | Apply | BTL-3 |

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| **PARTC** |
| 1. | **Analyze**the challenges and requirements faced by the IoT systems,which paved way to network architecture and compare the two bestknownarchitecture supported by OneM2M andIoTWF. | Analyze | BTL-4 |
| 2. | **Prepare**adetailedanalysisofsmartobjectsandtheirarchitecturetherebyelaboratingthedesignlimitationsandrolewithinIoTNetworks. | Create | BTL-6 |
| 3. | **Develop**anarrationonIoTAccesstechnologiesthatplaysamajorroleinmarket. Give suitableexamples explaining thetechnologies. | Create | BTL-6 |
| 4. | **Measure**thedifferenttypesofphysicalconditionsfordenotingthevarioustypes of sensorsand tabulatethem. | Evaluate | BTL-5 |
| **UNITIIIoT PROTOCOLS** |
| IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g,802.15.4e,1901.2a,802.11ahandLoRaWAN–NetworkLayer:IPversions,ConstrainedNodesandConstrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power andLossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – ApplicationLayerProtocols: CoAP and MQTT |
| **PARTA** |
| 1. | **Define** IEEE802.15.4 | Remember | BTL-1 |
| 2. | **WhereIEEE. 802.15.4**can be deployed? | Remember | BTL-1 |
| 3. | **Analyze**theuseofZigBee. | Analyze | BTL-4 |
| 4. | **Examine**the use of IEEE1901.2a. | Remember | BTL-1 |
| 5. | **Illustrate**thehighlevel ZigBeeProtocolstack. | Apply | BTL-3 |
| 6. | **Give**the purpose of IEEE 802.15.4 MAC layer. | Understand | BTL-2 |
| 7. | **Compare**ZigBee and ZigBee IP. | Analyze | BTL-4 |
| 8. | **Analyze**theprocessto optimizeIPforIoT. | Analyze | BTL-4 |
| 9. | **Demonstrate**the use ofMQTT. | Apply | BTL-3 |
| 10. | **Express**theIEEE802.15.4MACFormat. | Understand | BTL-2 |
| 11. | **Examine**theuseofRoLL. | Apply | BTL-3 |
| 12. | **Generalize** onCoAP. | Create | BTL-6 |
| 13. | **Distinguish**IEEE 802.15.4g and IEEE 802.15.4e. | Understand | BTL-2 |
| 14. | **Define** SCADA. | Remember | BTL-1 |

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| 15. | **Evaluate**theprotocoltranslation ofSCADA. | Evaluate | BTL-5 |
| 16. | **Formulate**onconstrained nodesand constrainednetworks. | Create | BTL-6 |
| 17. | **Differentiate**MeshUndervsMesh-OverRouting. | Understand | BTL-2 |
| 18. | **Conclude**the processfrom6LoWPANto 6Lo. | Evaluate | BTL-5 |
| 19. | **Define** LoRaWANand drawMACformat. | Remember | BTL-1 |
| 20. | **List** the IoTApplicationTransport methods. | Remember | BTL-1 |
| **PARTB** |
| 1. | 1. **Tabulate**theprotocolstacks utilizingIEEE802.15.4. (5)
2. **Describe**on IEEE 802.15.4g and IEEE 802.15.4e. (8)
 | Remember | BTL-1 |
| 2. | **Analyze** in detail LoRa WAN technology, illustrating the layers , MACformatand Architecture. | Analyze | BTL-4 |
| 3. | **Compare**andcontrastthephysicalandMAClayersofIoTAccesstechnologieswith suitable illustrations. | Evaluate | BTL-5 |
| 4. | **Discuss** thefollowing:1. OptimizingIP forIoT:(6)
2. Needfor OptimizationConstrained nodesand Networks.(7)
 | Understand | BTL-2 |
| 5. | **Examine** the following with neat illustration(i)1901.2a, (6)(ii)802.11ah(7) | Remember | BTL-1 |
| 6. | **Demonstrate**in detailabout IPversions andOptimizing IPfor IoT. | Apply | BTL-3 |
| 7. | **Summarize**theApplicationTransportMethods:SupervisoryControlandDataAcquisition. | Understand | BTL-2 |
| 8. | **Describe**about ApplicationLayer Protocols:1. CoAP(7)
2. MQTT(6)
 | Remember | BTL-1 |
| 9. | **Tabulate** the main characteristics ofAccess Technologies andthe variationineachofthem. | Remember | BTL-1 |
| 10. | **Discuss**indetailaboutApplicationtransportmethodandApplicationlayerprotocol. | Understand | BTL-2 |
| 11. | **Analyze**indetailSupervisoryControlandDataAcquisitionwithsuitableillustration. | Analyze | BTL-4 |
| 12. | **Demonstrate**RoutingoverLowPowerandLossyNetworkswithsuitableexplanation. | Apply | BTL-3 |
| 13. | **Generalize** indetailabout:1. OptimizingIP forIoT (6)
2. 6LoWPANto 6Lo(7)
 | Create | BTL-6 |
| 14. | **Analyze**LossyNetworksand RoLLindetail. | Analyze | BTL-4 |

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| **PARTC** |
| 1. | **Analyze**indetailtheIoTApplicationprotocolandtheircharacteristicswithsuitable illustration. | Analyze | BTL-4 |
| 2. | **Prepare**abriefreportonIEEE802.15.4,IEEE802.15.4gandIEEE802.15.4e,IEEE 1901.2a, IEEE 802.11ah, LoRaWAN | Create | BTL-6 |
| 3. | **Generaliz**eindetailaboutApplicationtransportmethod:SCADAandApplicationlayer protocol: CoAPand MQTT | Create | BTL-6 |
| 4. | **Explain**indetailtheneedforoptimizationandOptimizingIPforIoT:From6LoWPANto 6Lo, | Evaluate | BTL-5 |
| **UNITIIIDESIGNAND DEVELOPMENT** |
| DesignMethodology-Embeddedcomputinglogic-Microcontroller,SystemonChips-IoTsystembuilding blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry PiwithPythonProgramming. |
| **PARTA** |
| 1. | **List**thestepsinvolvedinIoTDesignmethodology. | Remember | BTL-1 |
| 2. | **Give**thecharacteristicsofEmbedded computing. | Remember | BTL-1 |
| 3. | **Name**theIoTsystembuildingblocks. | Remember | BTL-1 |
| 4. | **Give**anexampleIoTdeviceandexplain briefly. | Analyze | BTL-4 |
| 5. | **Differentiate**functionalview andoperational viewof IoTDesignmethodology. | Understand | BTL-2 |
| 6. | **Examine**theintegrationofdeviceandcomponentinIoTdesignmethodology. | Apply | BTL-3 |
| 7. | **Compare**sensorsandactuators. | Analyze | BTL-4 |
| 8. | **Examine**the useand purposeof Arduino. | Remember | BTL-1 |
| 9. | **Name**the linuxversion onRaspberry Pi. | Remember | BTL-1 |
| 10. | **Summarize**onRaspberry Pi. | Evaluate | BTL-5 |
| 11. | **Discuss** onArduino software programsketches. | Understand | BTL-2 |
| 12. | **Illustrate**theblockdiagramofIoTDevice. | Apply | BTL-3 |
| 13. | **Discuss** oninterfacingLDR withRaspberryPi. | Understand | BTL-2 |
| 14. | **Analyze**theinterfacesinRaspberryPi. | Analyze | BTL-4 |
| 15. | **Summarize**ontheneedofmicrocontrollerin embeddedsystem. | Analyze | BTL-2 |
| 16. | **Generalize** oncontrollingLEDwithRaspberryPi. | Create | BTL-6 |

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| 17. | **Illustrate**the basicarduino board. | Apply | BTL-3 |
| 18. | **Summarize**onother IoTdevices apartfromRaspberry Pi. | Evaluate | BTL-5 |
| 19. | **Generalize** onthevariouschips onembeddedsystem. | Create | BTL-6 |
| 20. | **List** theessential requirementsforsetting upRaspberryPi. | Remember | BTL-1 |
| **PARTB** |
| 1. | **Demonstrate**thekeystepsinvolvedinIoTDesignmethodology,explainthesteps involved in | Apply | BTL-3 |
| 2. | 1. **Summarize**indetailaboutembeddedcomputing.(6)
2. **Explain**themicrocontrollerandchipsinvolvedinembedded devices.(7)
 | Evaluate | BTL-5 |
| 3. | **Formulate**on pythonprogrammingforRaspberry Pi. | Create | BTL-6 |
| 4. | **Discuss**indetailtheuseofembeddedcomputinginthedesignofIoTSysems. | Understand | BTL-2 |
| 5. | 1. **Analyze** indetailanexemplarydevice:RaspberryPi.(6)
2. **Explain**indetailthe RaspberryPiinterfaces. (7)
 | Analyze | BTL-4 |
| 6. | **Illustrate**thearduinoboarddetailsandexplainthestepsforinstallingtheboard. | Apply | BTL-3 |
| 7. | **Discuss**indetailthebuildingblocksofIoTanditsfunctionalitieswithsuitable illustration. | Understand | BTL-2 |
| 8. | 1. **List**the IoTdesignmethodology.(6)
2. **Examine**thebuildingblocks ofIoT.(7)
 | Remember | BTL-1 |
| 9. | **Describe**the stepsfor designingIoTsystemwithneat diagram. | Remember | BTL-1 |
| 10. | 1. **Examine**theprocessofusingtheIntegratedDevelopmentEnvironment(IDE)to prepare an Arduino sketch. (7)
2. **Describe**the steps for setting up ofarduino board. (6)
 | Remember | BTL-1 |
| 11. | **DefineIoT**deviceandgiveadetailednarrationofIoTdeviceexampleinreal world applications. | Remember | BTL-1 |
| 12. | **Discuss**indetailtheInterfacingLEDandswitchwithRaspberryPiasanexample.Givetheprocedure. | Understand | BTL-2 |
| 13. | **Analyze**thesoftwareandhardwarefeaturesofArduinoboardandexplaintheprocedure to install IDE. | Analyze | BTL-4 |
| 14. | **Analyze**theembeddedcomputinglogicanduseofmicrocontrollerinembeddedsystemwith neatdiagram. | Analyze | BTL-4 |
| **PARTC** |
| 1. | **Analyze**indetailthedesignmethodologyusedtoimplementIoTDevices,explainthe level wise design steps with neat diagram. | Analyze | BTL-4 |
| 2. | **Pointout**someexamplesthatdefineIoTdevicesandexplaininbriefthebasicbuilding block andlayersin IoTsystemwith diagram. | Evaluate | BTL-5 |

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| 3. | **Analyze**andexplainindetailProgrammingRaspberryPiwithpythonbygivingsuitable example. Alsoelaborate on Raspberry Piinterfaces. | Analyze | BTL-4 |
| 4. | **Design**abasicarduinoboardandexplaintheprocedureforinstallingandsetting up ofIDE. | Create | BTL-6 |
| **UNITIVDATAANALYTICSANDSUPPORTING SERVICES** |
| Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – NoSQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics andNetworkAnalytics–XivelyCloudforIoT,PythonWebApplicationFramework–Django–AWSforIoT–SystemManagement withNETCONF-YANG. |
| **PARTA** |
| 1. | **Define** MachineLearning. | Remember | BTL-1 |
| 2. | **Generalize**theuseof AWSinIoT. | Create | BTL-6 |
| 3. | **Compare**Datain motionvs DataatRest. | Evaluate | BTL-5 |
| 4. | **Define** Neural networks. | Remember | BTL-1 |
| 5. | **Compare**thetwocategories ofmachinelearning. | Analyze | BTL-4 |
| 6. | **Analyze**theuseof NoSQLDatabase. | Analyze | BTL-4 |
| 7. | **Summarize**onHadoop. | Analyze | BTL-4 |
| 8. | **Differentiate**StructuredvsUnstructuredData. | Understand | BTL-2 |
| 9. | **Discuss** onHadoopecosystem. | Understand | BTL-2 |
| 10. | **Give**the benefitsof flowanalytics. | Understand | BTL-2 |
| 11. | **Summarize** on Edgestreaminganalytics. | Evaluate | BTL-5 |
| 12. | **Define** YARN. | Remember | BTL-1 |
| 13. | **Name**the corefunctions ofEdge Analytics. | Remember | BTL-1 |
| 14. | **Demonstrate**the use ofXively cloud for IoT. | Apply | BTL-3 |
| 15. | **Examine**theroleof PythonWebapplication framework –Django. | Apply | BTL-3 |
| 16. | **Discuss** onApache spark. | Understand | BTL-2 |
| 17. | **Formulate**on Apache Kafka. | Create | BTL-6 |
| 18. | **Compare**BigData andEdge Analytics. | Apply | BTL-3 |

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| 19. | **Define** AmazonS3and AmazonRDS. | Remember | BTL-1 |
| 20. | **Identify**therole ofvariouscomponentsofNETCONF-YANG. | Remember | BTL-1 |
| **PARTB** |
| 1. | **Explain**indetailtheneedofDataAnalyticsforIoTandbriefthechallengesfaced by IoTData Analytics. | Analyze | BTL-4 |
| 2. | **Discuss** in detail about1. Roleof Machine Learningin IoT. (6)
2. NoSQLDatabases.(7)
 | Understand | BTL-2 |
| 3. | **Describe**indetailaboutHadoopecosystemandthetwokeycomponentswithsuitable illustration. | Remember | BTL-1 |
| 4. | **Compare**indetail about1. StructuredVsUnstructured Data.(6)
2. Datain Motion Vs Datain Rest. (7)
 | Apply | BTL-3 |
| 5. | **Evaluate**thenecessityofApacheKafka andApacheSparkwithdiagram. | Evaluate | BTL-5 |
| 6. | **Express**indetailEdgestreaminganalyticsandcompareitwithdataanalytics.Also give the functions ofEdge analytics. | Understand | BTL-2 |
| 7. | **Examine**theneedforNetworkAnalyticsanddiscussonflexibleNetflowArchitecture. | Remember | BTL-1 |
| 8. | **Discuss**indetailaboutXivelycloudforITandIllustrateXivelydashboarddevicedetails. | Understand | BTL-2 |
| 9. | **Examine**thePythonWebApplicationframework–Djangoarchitectureandstepstodevelop a django project. | Apply | BTL-3 |
| 10. | **Generalize**thepurposeof Amazon WebserviceforIoT. | Create | BTL-6 |
| 11. | **Analyze**theroleofvariouscomponentsofNETCONF-YANGandstepsforIoT device Management with NETCONF-YANG. | Analyze | BTL-4 |
| 12. | **Discuss** the key components ofhadoopecosystem: HDFSandMapreduce. | Remember | BTL-1 |
| 13. | **Analyze**theuseof1. Python Web ApplicationFramework–Django.(6)
2. AWSfor IoT.(7)
 | Analyze | BTL-4 |
| 14. | **Discuss** onEdge streaminganalyticsand Dataanalytics ofIoT. | Remember | BTL-1 |
| **PARTC** |
| 1. | **Generalize** in detail about Apache spark and Apache kafka with data flowdiagram. | Create | BTL-6 |
| 2. | **Analyze**indetailaboutDataAnalyticsinIoTandtheroleofMachineLearningwith suitableillustration. | Analyze | BTL-4 |
| 3. | **Evaluate**theworkingofXivelyClouddashboarddeviceforIoTbygivingsuitablenecessary explanation. | Evaluate | BTL-5 |
| 4. | **Generalize** the purpose of Python Web Application Framework – DjangoandAmazonWeb service for IoT. | Create | BTL-6 |

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| **UNITVCASESTUDIES/INDUSTRIALAPPLICATIONS** |
| Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model(CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layeredarchitecture,Smart Lighting, Smart ParkingArchitecture andSmart Traffic Control |
| **PARTA** |
| 1. | **List** thesixpillars/components ofCiscoIoTSystems. | Remember | BTL-1 |
| 2. | **Define**WatsonIoTPlatform. | Remember | BTL-1 |
| 3. | **Brief** thesublayers ofsecurityinIoTsystems. | Remember | BTL-1 |
| 4. | **Analyze**theuseofFogComputing. | Analyze | BTL-4 |
| 5. | **Classify**thekey featuresofIBM Watsonplatform. | Apply | BTL-3 |
| 6. | **Summarize**theuseofWatson Conversationservices. | Evaluate | BTL-5 |
| 7. | **Describe**inbrief ConvergedPlantwide EthernetModel. | Remember | BTL-1 |
| 8. | **Relate** theuseof blockchainservicesinIBM WatsonIoTplatform. | Apply | BTL-3 |
| 9. | **Classify**theimplementationanddesignguidanceofCPwE. | Apply | BTL-3 |
| 10. | **Compose**thethree stagesof powersupply-chaininpower utilityindustry. | Create | BTL-6 |
| 11. | **Compose**theuseofsmarttrafficapplication. | Create | BTL-6 |
| 12. | **Infer** howIoTdata areSecurelyconnected, managedandanalysed. | Analyze | BTL-4 |
| 13. | **Summarize** onGridBlocksreferencemodel. | Understand | BTL-2 |
| 14. | **Tell**thechallengesthatbecomeevenmoreevidentastheITandOTnetworksbecomeinterconnected. | Remember | BTL-1 |
| 15. | **Give**thebenefitsprovidedbyTheGridBlocksreference architecturetoutilityoperators. | Understand | BTL-2 |
| 16. | **Discuss** anyone usecaseof smartapplicationsof IoT. | Understand | BTL-2 |
| 17. | **Conclude**AnIoT Strategyfor SmarterCities. | Evaluate | BTL-5 |
| 18. | **Express**why LEDtechnology isused instreet lighting? | Understand | BTL-2 |
| 19. | **Define** connectedmanufacturing. | Remember | BTL-1 |
| 20. | **Analyze**thesmartparkingusecase. | Analyze | BTL-4 |

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| **PARTB** |
| 1. | **Analyze**thepurposeof theSix-PillarApproachfor CiscoIoTSystemalsoexplainthe security framework. | Analyze | BTL-4 |
| 2. | **Examine**theFeaturesofIBMWatsonIoTplatform,andbriefontheservicesprovided init. | Remember | BTL-1 |
| 3. | 1. **Describe**anIoT strategyfor connected Manufacturing.(6)
2. **Examine**thearchitecturefor connectedfactory.(7)
 | Remember | BTL-1 |
| 4. | **Analyze**indetailthearchitectureofConvergedPlantwideEthernetModelwithsuitable illustration. | Analyze | BTL-4 |
| 5. | **Examine**thechallengesfacedforparkingincities,andexplainhowsmartparkingprovides a solution to this. | Remember | BTL-1 |
| 6. | 1. **Demonstrate**the use ofPower Utility Industry. (7)
2. **Examine**theIT/OT dividein Utilities.(6)
 | Apply | BTL-3 |
| 7. | **Illustrate**the11-TieredReferenceArchitectureofGridBlocksandtheuseofreferencemodel. | Apply | BTL-3 |
| 8. | 1. **Summarize** indetailthearchitecture modelof CPwE**.(7)**
2. **Discuss**ondesignandimplementation guidanceofCPwE.(6)
 | Understand | BTL-2 |
| 9. | **Summarize**onthesolutionforsmartlightingandexplainstreetlightingarchitecturein detail. | Evaluate | BTL-5 |
| 10. | 1. **Generalize** anIoTstrategy forsmartcity.(6)
2. **Design**ansmartcitylayered architectureandexplainhowsecurityisprovided.(7)
 | Create | BTL-6 |
| 11. | **Discuss**thefeaturesofCiscoIoTSystemandexplainthecomponentsandsecurityinvolved init. | Understand | BTL-2 |
| 12. | **Describe**thearchitectureofsmarttrafficcontrolarchitectureandexplaintheapplications ofsmart traffic. | Understand | BTL-2 |
| 13. | **Analyze**thegridblockreferencemodelandthereferencearchitecturewithsuitableillustration. | Analyze | BTL-4 |
| 14. | 1. **Define**anyoneusecseexample ofsmartcityexamples.(6)
2. **Describe**thesmartcitysecurityarchitecture. (7)
 | Remember | BTL-1 |
| **PARTC** |
| 1. | **Analyze** the IoT platform designed by IBM Watson, explain what it can doto your business, and infer how IoT data are securely connected, managedandanalyzed. | Analyze | BTL-4 |
| 2. | **Prepare**anIoTstrategyforsmartcityanddesignthelayeredarchitectureforimplementingsmartcities. | Create | BTL-6 |
| 3. | **Consider**anyusecaseexampleofsmartapplicationsofIoT,explainthearchitectureand technologyneed inbuildingtheapplication. | Evaluate | BTL-5 |
| 4. | **Formulate**anIndustrialapplicationofIoTsystemandbriefonthevarioususecaseof smart and connected cities. | Create | BTL-6 |