10 DEC 2022

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

Affiliated to Savitribai Phule Pune University

M.Sc.–II (Semester: III)

Electronic Science

Electronic Communication

ELS5301

2019 Pattern (4 Credits)

Time: 3 Hours] **[Max. Marks : 50**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five).** **[5×2=10]**

a) Define radio waves. List different types of wave propagation.

b) Explain the terms. i) Flicker noise. ii) Transit time noise.

c) A carrier of 100V and 1200 kHz is modulated by a 50 V, 1000 Hz sine wave signal. Find the Modulation index in percent.

d) List the digital transmission techniques.

e) List common laser types. Which one used for long distance application?

f) Define modulation. What is need of modulation?

Q2) **Answer the following questions (Any Three)** **[3×3=9]**

a) Explain the sky wave propagation of electromagnetic waves.

b) For AM, prove that the power contained in the SSB one third of the total power of the signal.

c) The relative refractive index difference for an optical fiber is 1%. Determine the critical angle at the core cladding interface if the core refractive index is 1.46.

d) What is de-emphasis? Explain the need for de-emphasis.

Q3) **Answer the following questions (Any Three)** **[3×3=9]**

a) Write short note on Ionospheres.

b) A Numerical aperture of fiber- optic cable is 0.39. what is the critical angle?

c) Draw and explain the block diagram of Delta modulation.

d) In a FM system, the frequency deviation is 40 kHz a modulating signal of amplitude 20V and frequency 4 kHz is applied. Calculate the modulation index.

Q4) **Answer the following questions (Any Three)** **[3×3=9]**

a) What are the advantages of SSB system? With the help of diagram explain SSB transmitter using phase shift method.

b) With the help of neat diagram, explain the working of FDM.

c) Define the following terms for AM

I. RF selection

II. Sensitivity

III. Selectivity

d) List the advantages of multimode fiber over single mode fiber.

Q5) **Answer the following questions (Any Two)** **[2×4=8]**

a) A transistor amplifier has a measured signal to noise power of 30 at its input and 15 at its output. Calculate the noise ratio and noise figure.

b) List the methods of FM generation. Explain any one of them in detail.

c) Explain the following terms with reference PCM

I. Quantization

II. Quantization noise

III. Encoding

Q6) **Answer the following questions (Any One)** **[1×5=5]**

a) In AM modulation, prove that $\frac{Pt}{Pc} = 1 + \frac{m^2}{2}$, and show that the power contained in the sideband is one third of the total power.

b) The signal voltage is 1.2 μV and the noise is 0.3 μV. if the signal power is 5 μW and the noise power is 125 nW. Calculate the signal to noise ratio in terms of voltage and power in dB.

17-12-22 O/C
2:30

Deccan Education Society's
FERGUSSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc. II (Semester: III)
Electronic Science
Data Communication and WSN
ELS5303
2019 Pattern (4 Credits)

Time: 3 Hours] **[Max. Marks : 50**

Instructions to the candidates:
1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five)** **[5×2=10]**

a) What are standards? Name any four standard organizations.

b) What are ISPs?

c) What is the point-to-point protocol?

d) Draw a sine wave and explain the various parameters it represents and draw a sketch representing each of them.

e) Define single-bit error and burst error

f) Compare MANET and WSN

Q2) **Answer the following questions (Any Three)** **[3×3=9]**

a) Identify the following IP addresses and their address class:

i. 200.58.20.165

ii. 11.12.20.1

b) Define Amplitude shift keying. Explain binary amplitude shift keying and its implementation.

c) List the responsibilities details of the Network layer and Transport layer.

d) Explain the concept of FDMA. and TDMA and compare it with FDM & TDM.

Q3) **Answer the following questions (Any Three)** **[3×3=9]**

a) Enlist a comparison between a piconet and a scatternet.

b) Write the definition of the following transmission mode with diagrams
i) parallel ii) serial iii) synchronous iv) asynchronous transmissions.

c) Briefly explain the coaxial cable and optical fiber with their applications

d) With a neat schematic explain the frame structure of the PPP protocol.

Q4) **Answer the following questions (Any Three)** **[3×3=9]**

a) Specify in short, the application of Wireless Sensor Networks in the health sector.

b) Explain the duties of the Physical layer and Data Link layer in the OSI model.

c) What are the differences between parallel and serial transmission?

d) Explain UDP, TCP, and SCTP Protocols at the transport layer?

Q5) **Answer the following questions (Any Two)** **[2×4=8]**

a) Draw the basic block diagram of data communication systems and explain the different components of a system

b) What are the functions of IP, ARP, RARP, ICMP, and IGMP Protocols in the network layer?

c) Calculate the Shannon channel capacity in the following cases: Bandwidth = 20Khz SNRdb = 40 . A file contains 3 kilobytes. How long does it take to download this file using a 100kbps channel?

Q6) **Answer the following questions (Any One)** **[1×5=5]**

a) Explain TCP/IP architecture with a layer diagram.

b) What do you mean by transmission impairment? Explain the causes of transmission impairment.

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Deccan Education Society's
FERGUSSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University

M.Sc.–I (Semester: I)
Electronic Science
Network Analysis
ELS4102
2019 Pattern (4 Credits)

Time: 3 Hours] **[Max. Marks : 50**

Instructions to the candidates:
1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five)** **[5×2=10]**

a) Model a simple passive RC low pass filter using the transfer function.

b) Define transfer admittance for a two-port network.

c) What do you mean by poles and zeros of a transfer function?

d) Define "Electrical Signals", what are different types of signals?

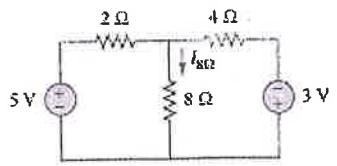
e) State maximum power transfer theorem.

f) If $Z_{11} = 2\ \Omega; Z_{12} = 1\ \Omega; Z_{21} = 1\ \Omega\ and\ Z_{22} = 3\ \Omega$, what is the determinant of admittance matrix.

Q2) **Answer the following questions (Any Three)** **[3×3=9]**

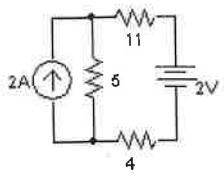
a) Explain the concept of transfer function for modelling a given electrical system.

b) Solve for the current flowing through the 8 Ω resistor for the given below circuit.



c) Find Laplace transform of $f(t) = Sin(at)$

d) In the circuit given below, determine the power consumed by 4Ω resistor. (All the values of resistors are in ohm.)



Q3) **Answer the following questions (Any Three)** **[3×3=9]**

a) Explain the terms node, tree, branch in connection with electrical network.

b) Find the inverse Laplace transform of $F(s) = \frac{2s}{s^2-9}$

c) Draw the pole and zero diagram for the given network function I(s). Obtain i(t).

$$I(s) = \frac{4s}{(s+1)\,(s+2)}$$

d) Give the classification of signals with respect to CT and DT.

Q4) **Answer the following questions (Any Three)** **[3×3=9]**

a) State Norton's theorem for DC resistive network using suitable example

b) The T equivalent of a resistive network is characterized by R_1= 2.25Ω, R_2= 1.5Ω, and R_3= 2.7Ω. Obtain its π equivalent.

c) For a given denominator polynomial Q(s) of a network function, determine the nature of stability of the network using Routh criterion $Q(s) = s^3 + 2s^2 + 8s + 22$

d) State final value theorem and hence determine the steady state current i(t) assuming,

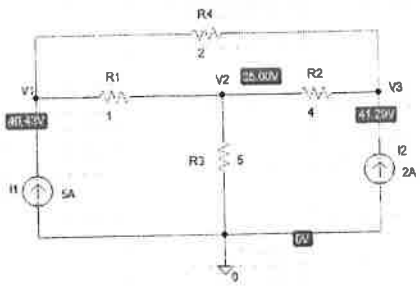
$$I(s) = \frac{s+6}{s(s+3)}$$

Q5) **Answer the following questions (Any Two)** **[2×4=8]**

a) A ramp voltage r(t)= 4t volt is applied to series circuit of inductor (2H) and resistor (4Ω). Determine voltage, v(t) across the inductor.

b) List out few applications of Continuous-Time Systems and Discrete-Time Signals

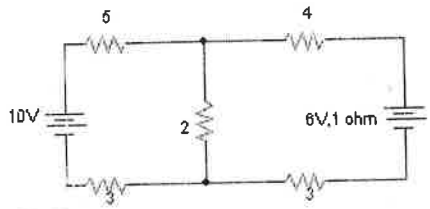
c) For the circuit shown below, find the nodal voltages V_1 ,V_2 and V_3 (Resistance values are in ohm)



Q6) **Answer the following questions (Any One)** **[1×5=5]**

a) Obtain Z-transform of the finite sequence $x(n)$ given by $x(n) = \{1,2,4,5,0,7\}$, hence obtain its ROC.

b) Use the mesh analysis to find the current flowing through the resistor 5Ω, 4Ω and 2Ω. (Resistance values are in ohm)



02 JAN 2023

O/c

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

Affiliated to Savitribai Phule Pune University

M.Sc.–I (Semester: I)

Electronic Science

Semiconductor Devices and Technology

ELS4101

2019 Pattern (4 Credits)

Time: 3 Hours] **[Max. Marks : 50**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five).** **[5×2=10]**

a) Define conversion efficiency of a solar cell.

b) List the different type of solids.

c) What are the types of extrinsic semiconductor? Explain in short.

d) List the types of semiconductor material.

e) State the types of photodiode. Which is the fastest among these?

f) Define the lattice structures of simple cubic and body centered cubic.

Q2) **Answer the following questions (Any Three)** **[3×3=9]**

a) Compare MOSFET and JFET.

b) With the help of diagram explain PN Junction formation.

c) Explain the condition of the cutoff, saturation, and active modes of BJT.

d) Show Einstein relation $\frac{D_n}{\mu_n} = \frac{KT}{e}$.

Q3) **Answer the following questions (Any Three)** **[3×3=9]**

a) Calculate the critical angle at a semiconductor–air interface. Index of refraction for GaAs is 3.66.

b) Explain the oxidation method. List the different types of oxidation.

c) Explain the Czochralski method experiment for semiconductor crystal growth.

d) Develop the procedure for obtaining the Miller indices that describe a plane in a crystal.

Q4) **Answer the following questions (Any Three)** **[3×3=9]**

a) Write a difference between a metal, an insulator and semiconductor.

b) Calculate the thermal equilibrium hole concentration in silicon at T = 400K, so that Fermi energy is 0.27eV above the valance band energy. The value of effective density of states function in the valance band at T = 300K is $N_v = 1.04\times 10^{19}\ cm^{-3}$.

c) List the thin fiim characterization techniques.

d) Assume an electron in an infinite potential well of width 5 Å. Calculate the first three energy levels of an electron in an infinite potential well.

Q5) **Answer the following questions (Any Two)** **[2×4=8]**

a) Explain various defects in a single-crystal lattice with appropriate diagram.

b) Describe working of n-channel JFET with proper I-V characteristics.

c) Determine the majority carrier concentration and mobility. A sample of silicon doped with 10^{16} Boron atoms/cm^3. The sample dimensions are $L = 10^{-1}cm$, $W = 10^{-2}cm$, $d = 10^{-3}cm$, $I_x = 1mA$, $V_x = 12.5V$, $V_H = -6.25mV$ and $Bz = 5 \times 10^{-2}$ Tesla

Q6) **Answer the following questions (Any One)** **[1×5=5]**

a) Draw an I-V characteristic of p-n junction solar cell. Discuss the short circuit current and open circuit voltage.

b) Elaborate the Eber-Moll model for BJT.

04 JAN 2023 O/C

Deccan Education Society's
FERGUSSON COLLEGE (Autonomous) Pune-4
Affiliated to Savitribai Phule Pune University
M.Sc.– I (Semester: I)
Subject: Electronic Science
Analog and Digital Circuit Design
ELS4103
2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:
1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five).** **[5 x 2 = 10]**

a) State Barkhausen Criterion for oscillations?

b) Define free capture range and lock range of Phase Locked Loop.

c) Draw the circuit diagram of Integrator and write the output equation.

d) Explain voltage doubler circuit.

e) Compare PAL and PLA.

f) Write Excitation table for D and JK-Flip-flop.

Q2) **Answer the following questions (Any Three)** **[3 x 3 = 9]**

a) What is Schmitt trigger? Explain inverting Schmitt trigger.

b) Define the terms open loop gain and virtual ground in op- amp.

c) Explain voltage divider biasing method of BJT amplifier.

d) Minimize the following Boolean expression using K- map and realize it using the basic gates.
Y= $\sum m(1,3,5,9,11,13)$

Q3) **Answer the following questions (Any Three)** **[3 x 3 = 9]**

a) An inverting amplifier has R_{in} =2k Ω and $R_f = 20k\Omega$, Calculate output voltage if the input voltage is 100mV.

b) Compare the active and passive filters?

c) Implement full adder using half adder. Explain with circuit diagram

d) Give the classification scheme of programmable logic devices.

Q4) **Answer the following questions (Any Three)** **[3 x 3 = 9]**

a) Write short note on non- linear wave shaping circuits.

b) Explain with block diagram - Phase locked loop.

c) Draw circuit diagram of log amplifier and explain in brief..

d) Design MOD-10 asynchronous counter and draw timing diagram

Q5) **Answer the following questions (Any Two)** **[2 x 4 = 8]**

a) Explain frequency response of band pass and band reject filter.

b) What is shift register? Explain different types of shift register.

c) Minimize the following expression using K-map:

$Y = A\bar{B}C + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}\bar{C}$

Q6) **Answer the following questions (Any One)** **[1 x 5 = 5]**

a) Explain two stage RC coupled amplifier. What is the function of coupling capacitor? If a two stage transistor based RC coupled amplifier has a gain of 5 at each stage. Calculate input voltage of each stage if output of second amplifier is 10Volt.

b) What is multiplexer and de-multiplexer? Implement following Boolean function using 3:8 decoder and external gates.

$F_1 = \sum m(1,3,4,6)$

$F_2 = \sum m(2,7,8)$

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O/C

Deccan Education Society's
Fergusson College (Autonomous)
Term-end Examination (Semester -I)
M. A. English (PART-I): Paper Code: ENG 4103
TITLE: Contemporary Studies in English Language- I
(2019 Pattern) (4 Credits)

Duration: 3 Hours ***Total Marks: 50***

Instructions:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1. Answer any one of the following questions: **[1x10=10]**

A) Define the term 'Linguistics' and discuss different characteristics of Language.
B) What are the various career opportunities for students of Linguistics?

Q2. Answer any one of the following questions: **[1x10=10]**

A) Bring out the difference between 'Phonology' and 'Phonetics' and explain their importance in enhancing the quality of spoken communication.
B) Define the term 'Syllable' and explain the concept 'Word Accent' by giving suitable examples.

Q3. **Write short notes on any two of the following:** **[2x5=10]**

A) Morphemes and Allomorphs
B) Inflectional and Derivational Morphemes
C) Affixation as the process of Word Formation
D) 'Clipping' and 'Acronymy'

Q4. Write short notes on the following: **[2x5=10]**

A) Distinction between 'Lexical' and 'Auxiliary' verbs
B) The Structure of a Basic Noun Phrase

Q5. Do as directed: **[10x1=10]**

1. The distinction between 'Langue' and 'Parole' was made by----------.
   (Fill in the blank)
2. 'Applied Linguistics' studies the relationship between brain and language.
   (State whether this statement is true or false)
3. Give an example of a Minimal Pair for /p/ and /t/.
4. Mark the primary accent in the word 'Astonishing'.
5. Identify the process of word formation in the word 'Brunch'.
6. Bound morphemes cannot stand independently by themselves.
   (State whether this statement is true or false)

7. Give an example of a 'Derivational' morpheme.
8. My neighbour sold his bike last night. (Identify the elements of sentence structure)
9. A----------sentence has only one finite verb. (Fill in the blank)
10. Tomorrow is a holiday. (Identify the type of verb as Intensive, Extensive Transitive, etc and justify your response)

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dE

10.5 JAN 2023

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

Affiliated to Savitribai Phule Pune University

M.Sc.–I (Semester: I)

Electronic Science

Instrumentation

ELS4104

2019 Pattern (4 Credits)

Time: 3 Hours] **[Max. Marks : 50**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five).** **[5×2=10]**

a) Classify transducers and give an example of each.

b) Compare digital and analogue transducers.

c) What is the working principle of capacitive transducer?

d) What is gauge factor?

e) State the applications of bio-medical instrumentation system.

f) List the features of IoT (any four).

Q2) **Answer the following questions (Any Three)** **[3×3=9]**

a) Explain construction and working of load cell and state the types.

b) A platinum thermometer has a resistance of 100 Ω at 25°C. Find its resistance at 65°C if the platinum has a temperature coefficient of 0.00392/°C.

c) Compare DSO with CRO.

d) What are MEMS sensors? Explain the construction technique of MEMS.

Q3) **Answer the following questions (Any Three)** **[3×3=9]**

a) What is self-heating in Thermistors? In thermistor, suppose I = 5 mA, R_T = 4 kΩ, and the power dissipation factor (δ) = 0.067 W/°C, what is ΔT?

b) Discuss important features of CRT.

c) With proper diagram give construction and working of bourdon tube for pressure measurement.

d) Describe the operation of the Wheatstone bridge.

Q4) **Answer the following questions (Any Three)** **[3×3=9]**

a) Explain flapper and nozzle system with appropriate diagram.

b) What is thermocouple? Explain the cold junction compensation in brief.

c) Write short note on Electroencephalogram (EEG).

d) With a neat sketch explain the operation of Spectrum Analyser.

Q5) **Answer the following questions (Any Two)** **[2×4=8]**

a) Explain the basic structure and working of LVDT.

b) List the various types of strain gauge and explain any one with neat diagram.

c) What is the working principle of ECG? Explain the normal ECG waveform.

Q6) **Answer the following questions (Any One)** **[1×5=5]**

a) With the help of block diagram explain the functioning of a Digital Multimeter (DMM).

b) A strain gauge is bounded to a beam 0.1m long and has a cross sectional area $4cm^2$ .Young's modulus for steel is 207 GN/m^2. The strain gauge has an unstrained resistance of 240Ω and gauge factor of 2.2. When a load is applied, the resistance of gauge changes by 0.013Ω. Calculate the change in length of the steel beam and an amount of force applied to the beam.

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O/C

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

Affiliated to Savitribai Phule Pune University

M.Sc.–II (Semester :III)

Electronic Science

Embedded System Design with ARM

ELS5302

2019 Pattern (4 Credits)

Time: 3 Hours] **[Max. Marks : 50**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five)** **[5×2=10]**

a) What is nomenclature of ARM7TDMI?

b) What is External Interrupt in LPC2148 ARM7 Microcontroller?

c) List at least four features of LPC2148.

d) Draw the structure of operating system (OS) and list the four OS.

e) What is Hard and Soft real time system? List the examples of both.

f) List at least four features of µC/OS-II RTOS.

Q2) **Answer the following questions (Any Three)** **[3×3=9]**

a) What is 'little-endian' and a 'big-endian' memory organization used by the ARM. Explain with suitable diagram.

b) Write a source code in assembly for addition of two 32 bits variables and place the result in memory location. Given : Value1= 0x12312341 and Value2 = 0x87654321

c) Draw the Real Time OS architecture and list its components.

d) Comment on foreground and background system in RTOS.

Q3) **Answer the following questions (Any Three)** **[3×3=9]**

a) Write an algorithm and source code for negative ramp wave generator for inbuilt DAC of LPC2148.Enable P0.25 pin as analog out Aout. Refer the given registers configuration.

b) What is Stack? How stack is implemented in ARM?

c) Differentiate process and task.

d) Explain critical section code and re-entrant code in RTOS?

Q4) **Answer the following questions (Any Three)** **[3×3=9]**

a) What is the function of following interrupt registers of VIC VICIntSelect, VICIntEnable and VICIntEnClr

b) Draw ARM programmer's model.

c) What are Semaphores and its types? Explain in detail one of its type.

d) What is the need of swapping in OS? Explain briefly swapping of process in MMU.

Q5) **Answer the following questions (Any Two)** **[2×4=8]**

a) ARM processor employs a 3-stage pipeline organization. Explain with the help of appropriate diagram.

b) Draw the structure of Monolithic and Micro-Kernel. List the examples of each kernel.

c) What is context switch? Explain the scenario of context switching in multi-tasking.

Q6) **Answer the following questions (Any One)** **[1×5=5]**

a) Develop a source Code in C to transmit string serially using UART0 of LPC2148 ARM7 Microcontroller. Initialize UART0 for Baud rate 19200 with character format 8 bits, no parity and one stop bit with VLSI peripheral clock pclk = 15 MHz, Write the calculations of UART0 Divisor Latch LSB register. Refer the given registers configuration.

b) What is Priority inversion? Explain the scenario of priority inversion problem with an example?

Register Configuration:

1. **PINSEL0**

Bit	Symbol	Value	Function
1:0	P0.0	00	GPIO
		01	TXD(UART0)
		10	PWM1
		11	Reserved
3:2	P0.1	00	GPIO
		01	RXD(UART0)
		10	PWM3
		11	EINT0
19:18	P0.25	00	GPIO
		01	AD0.4
		10	Reserved/Aout(DAC)
		11	Reserved

2. **DACR**

31 17	16	15 6	5 0
RESERVED	BIAS	VALUE	RESERVED

3. **VPBDIV/APBDIV**

Bit	Symbol	Value	Description
1:0	APBDIV	00	APB bus clock is one fourth of the processor clock.
		01	APB bus clock is the same as the processor clock.
		10	APB bus clock is one half of the processor clock.
		11	Reserved. If this value is written to the APBDIV register, it has no effect
7:2	-	-	Reserved, user software should not write ones to reserved bits. The value read from a reserved bit is not defined.

4. **UxLCR (Line Control Register)**

31:8	7	6	4:5	3	2	0:1
Reserved	DLAB	Break Control	Parity Select	Parity Enable	Stop bit	Word length select

5. **UxLSR (Line Status Register)**

31:8	7	6	5	4	3	2	1	0
Reserved	RXFE	TEMT	THRE	BI	FE	PE	OE	RDR

14 DEC 2022

O/C

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

Affiliated to Savitribai Phule Pune University

M.Sc.– I I (Semester: III)

Subject: Electronic Science

Internet of Things

ELS5304

2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five).** **[5 x 2 = 10]**

a) What is the Internet of Things IoT?

b) What is meant by "thing" in Internet of Things?

c) What is Raspberry Pi?

d) What is Tuple in Python?

e) What are negative indexes and why are they used?

f) Is Python a case sensitive language?

Q2) **Answer the following questions (Any Three)** **[3 x 3 = 9]**

a) What is Embedded systems? Explain basic characteristics of Embedded systems.

b) Explain characteristics of IoT and write the applications of IOT .

c) What is List in Python? What is the difference between List and Tuple?

d) With example explain SETS and explain use of SETS in Python?

Q3) **Answer the following questions (Any Three)** **[3 x 3 = 9]**

a) Explain following communication models of IoT

i. Publish-Subscribe model ii. Exclusive Pair Model

b) Differentiate between M2M and IoT.

c) What is object oriented programming in Python? What are classes and objects in Python?

d) What is GUI programming in Python? What is the use of *tkinter* in Python?

Q4) **Answer the following questions (Any Three)** **[3 x 3 = 9]**

a) Explain purpose and requirement specification in IoT design methodology.

b) What is SOC and what SOC comprises of in Raspberry Pi?

c) Write a Python program to get the largest number from a List1.

List1= [150,25,10, 180,50]

d) What is the output of the following code?

```
x=sum=0
while(x<=5):
        sum+=x
        x=x+1
print(sum)
```

Q5) **Answer the following questions (Any Two)** **[2 x 4 = 8]**

a) Explain following technologies in relation with IoT

1. Big Data Analytics
2. Communication Protocols

b) What is the output of the following code?

```
def display(name, age, salary):
        print("Name: ", name)
        print("Age: ", age)
        print("Salary: ",salary)
n =" XYZ "
a = 35
s = 123456
display(salary = s, name = n, age = a)
```

c) Write a Python program to find the factorial of a given number.

Q6) **Answer the following questions (Any One)** **[1 x 5 = 5]**

a) Explain various protocols needed for IoT systems in the following layers:

Link Layer, Network Layer, Transport Layer and Application Layer

b) Write a Python program to check if a number is positive, negative or zero. Accept the number from user.

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