Paper / Subject Code: 42771 / Instrumentation Project Documentation & Execution

BE/INST/SEM-VII/C.2019/DEC. 2022

Time: 3 Hours **Max. Marks: 80**

NB :

1) Question No.1 is **compulsory.**
2) Attempt any **three** questions out of the remaining questions.
3) Make suitable assumptions wherever necessary.

Q.1 Attempt **any Four** out of following questions: 20

a) Write significance of process flow diagram. What is MBS?

b) Describe project planning and scheduling, tools used for preparation of plan and schedule.

c) Explain the following ISA Standards- ISA 5.1, 5.2, 5.4, ISA20.

d) Design specification sheet for Orifice plate with ISA Standard.

e) Write short note on Control System Graphics.

Q.2

a) Draw and explain the P&ID for cascade control loop- Consider tank level as primary and feed flow as secondary loop. 10

b) Explain in detail project execution with different phases and activities involved. 10

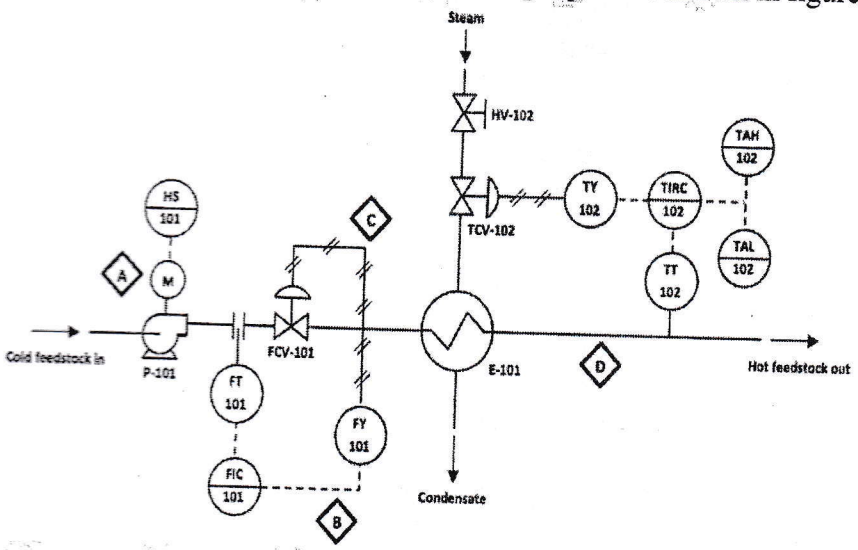
Q.3

a) Draw hookup diagram for differential pressure transmitter used in liquid service. 10

b) Describe commissioning stage with documentation prepared during this phase. 10

Q.4

a) Prepare Instrument index sheet in detail for Heat Exchanger process shown in figure no.1 10



(Fig No. 1- Heat Exchanger Process.)

b) Draw loop wiring diagram using ISA standard for flow control loop shown in above figure. (fig. no. 1 Heat exchanger process). 10

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Q.5

a) List steps in procurement process. Explain in detail each step with documents required. 10

b) What are steps in control system specification development?

Q.6

a) What are the Documentation Software Packages/tools used in instrumentation projects? What are advantages and disadvantages of software? 10

b) Describe Cable and Junction box scheduling with suitable example. 10

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(3 Hours) **Total Marks: 80**

Note:

1. **Question No.1 is compulsory**
2. **Solve any THREE questions out of remaining FIVE questions.**
3. **Figure to the right indicate full marks.**
4. **Assume suitable data if required.**

Q 1	Answer the following:	**(20)**
a)	List any five DCS vendors with their models.	**(04)**
b)	Write the difference between basic process control system and safety instrumented system.	**(04)**
c)	What do you mean by MES? Write benefits of MES.	**(04)**
d)	List the various inputs and outputs to and from RTU in SCADA.	**(04)**
e)	Explain the difference between the operation of a nonretentive timer and that of a retentive timer.	**(04)**
Q. 2 a)	Draw and explain the generic architecture of distributed control system.	**(10)**
b)	Define risk. Discuss different risk reduction methods with respect to Safety instrumented systems	**(10)**
Q. 3 a)	Develop a PLC ladder for the bottle filling plant. Your answer should include process sequence, I/O mapping, graphical user interface and ladder diagram.	**(10)**
b)	List the applications of SCADA and explain any one of them in detail.	**(10)**
Q. 4 a)	List the DCS displays. Suggest the appropriate DCS displays to get the following information and justify— i) Real pictures of equipments ii) Tuning parameters and alarm settings iii) Abnormal deviation at a glance	**(10)**
b)	Explain the significance of database management system in any automated plant.	**(10)**

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Q. 5 a) Calculate scan interval of SCADA system for the following cases and Comment on it ---- **(10)**

Case 1: i) Number of RTUs = 10
Each RTU has status points = 100
Alarm points = 30
Measurement meter (8 bits each) = 10
Analog points (16 bits each) = 10
ii) The MTU will send following point counts to RTU
Discrete control (valves) points = 100
Valve controller set points (16 bits each) = 10
iii) Baud rate = 1.2 Kbps
iv)Communication efficiency = 40%

Case 2: Number of RTUs and communication efficiency in case 1 is increased to 20 and 60% respectively, keeping rest of the specifications same as given for case 1.

b) What is the need of supervisory computer? Explain the major tasks performed by it. How is it interfaced with DCS? **(10)**

Q. 6 Write short notes on: **(Any TWO)** **(20)**

a) SCADA: MTU and RTU communication

b) Comparison between PLC, DCS and SCADA

c) Architecture of Industry 4.0

Time : 3 Hours **Total Marks : 80**

N. B. 1) Question No. **1** is **compulsory**.
2) Answer any **3** questions from the remaining **5** questions.
3) Assume suitable data wherever necessary.

Q1 Solve **any four** **20**
(a) What is the need of artificial pacemaker?
(b) Give the classification of bio potential electrodes?
(c) Explain the working principle of D.C. Defibrillator machine.
(d) Differentiate the CT Scan method with conventional X-ray method.?
(e) What are the physiological effects of electric current?

Q2 (a) What is the function of respiration system? Explain the human respiratory system along with following important terms: **10**
i) Total lung capacity
ii) Tidal volume and Residual volume
iii) Inspiratory reserve volume and Expiratory reserve volume
(b) Illustrate and discuss working of cardiovascular system with neat diagram. **10**

Q3 (a) What do you mean by systolic and diastolic blood pressure? Compare between direct and indirect blood pressure measurement. **10**
(b) Explain physiology of Nervous System with neat labelled diagram. What do you mean by the term "Synapse"? **10**

Q4 (a) Classify pacing modes of an artificial pacemaker. Explain anyone in detail. **10**
(b) What are the various heart sounds? Explain measurement of the same using a phonocardiograph. **10**

Q5 (a) Illustrate the principle of Haemodialysis system and what are the precautions need to be taken during dialysis. **10**
(b) How X-ray production is done? With neat sketch explain the block diagram of X-ray machine and list down the various applications. **10**

Q6 Write short note on **any two** **20**
(a) Electromagnetic blood flowmeter
(b) Ventilation system.
(c) Heart lung machine.

Duration: 3 hours **Total Marks: 80**

1. **Q1 is compulsory.**
2. **Answer any 3 questions from the remaining 5 questions (Q2 to Q6)**

Q1. Answer any four questions out of six questions. **(5 marks each)**

1. Differentiate between supervised and unsupervised learning.
2. What is feature scaling in ML?
3. What is meant by over fitting? Give the methods employed for reducing it.
4. Explain the concept behind Gradient descent with a diagram.
5. With a neat diagram, explain how the human neuron and perceptron are similar.
6. Define Precision and Recall. Explain the trade-off between them.

Q2. Answer the following: **(10 marks each)**

a. Derive the equation for the best fit line using the method of least squares, for linear regression. Also explain linear regression with a mathematical example.
b. Explain logistic regression. Derive its cost function using Maximum likelihood estimation.

Q3. Answer the following: **(10 marks each)**

a. Explain with an example, the concept and steps behind K-means clustering.
b. Explain the concept and steps behind implementation of Principle Component Analysis (PCA).

Q4. Answer the following: **(10 marks each)**

a. Explain Back propagation algorithm used in ANN. Discuss the steps involved in implementing back propagation algorithm, with a numerical example.
b. Explain working of decision tree with an example.

Q5. Answer the following: **(10 marks each)**

a. Explain the concept of working of linear SVM. How is the SVM modified if the data is not linearly separable?
b. Explain the Expectation-Maximization (EM) algorithm used in Gaussian Mixture Models (GMM).

Q6. Write short notes on: **(5 marks each)**

a. Reinforcement learning
b. Application of ML in Anomaly detection
c. Steps involved in design of ML system
d. Confusion matrix

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Time: 3 Hours **Max Marks:80**

Note: 1. Q1 is compulsory
2. Solve any three from remaining

Q1 Solve **any four** questions **20**

A. Role of science & Technology in Sustainable design of products
B. Simultaneous engineering
C. Explain Product design for Environment.
D. What is PLM? State its need and scope and phases.
E. What is digital mockup? State its benefits and list software used for it.

Q.2 A. What do you mean by Design for X. How will you use design for X tools in the design process? **20**

B. Explain useful life extension strategies.

Q.3 A. Explain the general framework of LCCA. **20**

B. What is sustainable development? Explain role of science & technology in it.

Q.4 A. Discuss new product development process **20**

B. Explain cost analysis and life cycle approach in detail.

Q.5 A. Explain the strategies for recovery at the end-of-life cycle **20**

B. What is the virtual product development process? Write its applications and advantages.

Q.6 A. Explain the product life cycle in detail with suitable example **20**

B. Explain various reasons for implementation of PDM system. Explain various barriers for PDM implementation

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Duration: 3hrs **[Max Marks: 80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1		Attempt **any FOUR**	**[20]**
	a	Differentiate between cybercrime and cyber fraud.	
	b	Explain various threats associated with cloud computing.	
	c	Explain methods of password cracking	
	d	Explain E-contracts and its different types.	
	e	Explain different attack vectors in cyber security	
2	a	Explain the classification of cybercrimes with examples.	**[10]**
	b	Explain various types of credit card frauds	**[10]**
3	a	Explain different buffer overflow attacks also explain how to mitigate buffer overflow attack	**[10]**
	b	Explain electronic banking in India and what are laws related to electronic banking in India	**[10]**
4	a	What do you understand by DOS and DDOS attack? Explain in detail.	**[10]**
	b	Write a note on Intellectual Property Aspects in cyber law.	**[10]**
5	a	Explain the objectives and features of IT Act 2000	**[10]**
	b	What are Botnets? How it is exploit by attacker to cause cyber attack?	**[10]**
6	a	Explain SQL injection attack. State different countermeasure to prevent the attack.	**[10]**
	b	Explain what is Information Security Standard and Explain HIPAA act in detail	**[10]**

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