

Registration No :

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Total Number of Pages : 02

B.Tech/
Integrated Dual Degree (B.Tech and M.Tech)
RCS5D002

5th / 7th Semester Reg/Back Examination: 2024-25

Artificial Intelligence & Machine Learning

AERO, AE, AME, CST, CSEDS, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, ELECTRONICS
& C.E, IT, MINING, CSE

Time : 3 Hour

Max Marks : 100

Q. Code : R338

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- Define an intelligent agent with an example.
- What is the difference between breadth-first search and depth-first search?
- Explain the concept of Alpha-Beta pruning in adversarial search.
- What are propositional logic and its significance in AI?
- State Bayes' theorem with an example.
- What is the purpose of Bayesian networks in AI?
- Define the term "Expert System" with an example.
- Explain the concept of neural net learning in machine learning.
- Differentiate between supervised and unsupervised learning.
- What is the role of heuristic search in problem-solving?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Explain the structure of an intelligent agent.
- What are the different types of environments in which AI agents operate?
- Describe the A* search algorithm with an example.
- How is logical reasoning applied in knowledge-based agents?
- Explain the syntax and semantics of First-Order Logic.
- What is the difference between propositional and first-order inference?
- Describe Bayes' rule and its application in probabilistic reasoning.
- What is the significance of independence in probabilistic reasoning?
- Discuss the concept of learning from examples with an example.
- Explain the architecture of an Expert System.
- What is meant by explanation-based learning?
- Describe genetic learning in AI.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Explain the concept of problem-solving agents in detail. Discuss different uninformed search strategies with examples. **(16)**
- Q4** Describe the Mini-Max algorithm and Alpha-Beta pruning. How do these methods optimize decision-making in adversarial search? **(16)**
- Q5** Explain the concept of Bayesian networks. Discuss both exact and approximate inference techniques used in Bayesian networks. **(16)**
- Q6** Discuss various machine learning methods. Provide a detailed explanation of neural net learning and its applications in AI. **(16)**

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RGT6A003

7th Semester Regular/Back Examination: 2024-25

SUBJECT: Green Technology

BRANCH(S): AUTO, BIOMED, BIOTECH, C&EE, CIVIL, CSEAI, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, EEE, ELECTRICAL, ECE, ELECTRONICS & C.E, ETC, IT, MMEAM, MECH, MME, METTA, MINING

Time: 3 Hours

Max Marks: 100

Q.Code: R147

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- What is photosynthesis?
- What are called carbon-neutral items? Give examples.
- What is MRV?
- What is the role of GRIHA?
- List any two renewable energy sources.
- What is net accumulation?
- What is Net- Zero?
- Suggest two eco-friendly materials used in green building.
- How does a solar PV system work?
- What are the windy sites found in India?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- Discuss the significance of green technologies in mitigating environmental issues with relevant examples.
- What are the possible steps recommended to stop deforestation?
- Briefly discuss about different sources of green house gases.
- What is zero-waste management?
- What is the concept of green infrastructure?
- Discuss about application of geothermal energy.
- Give a brief account of usage of fossil fuels.
- What is biofuel? Discuss the biofuel policy in India.
- Write down the different causes of global warming.
- Write short note on global warming potential.

- k) What is biomass energy, and how is it harnessed?
- l) Describe the adaptive measures necessary to cope with climate change.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Write short notes on a) Hydropower b) Kyoto Protocol (16)
- Q4** What are the steps can be taken for control of carbon emissions and accumulation? (16)
- Q5** Discuss about installation and working principle of solar PV panels. (16)
- Q6** Evaluate the impact of climate change on Indian agriculture. What adaptive strategies are essential to mitigate the effects of climate change on rural communities? (16)

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Total Number of Pages: 03

Course: B.Tech
Sub_Code: REL7D001

7th Semester Regular/Back Examination: 2024-25

SUBJECT: Advanced Control System

BRANCH(S): EEE, Electrical, EIE

Time: 3 Hours

Max Marks: 100

Q.Code: R090

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Derive the Z transform of the following $X(1) = 2$; $X(4) = -3$; $X(7) = 8$ and all other samples are zero. Define the stability of discrete time function.
- State Kalman's test for controllability.
- What is the basis of choosing state variables of a system?
- What is the State Transition Matrix and what are its significances?
- Explain Jump resonance in nonlinear closed loop system.
- If the eigen values of a system are -2 , -4 and -5 , write down the state transition matrix.
- What are the conditions for asymptotic stability at the origin?
- Use Jury's test to show that the two roots of the digital system $F(z) = z^2 + z + 0.25 = 0$ are inside the circle.
- What do you mean by sign definiteness of a function?
- What do you mean by piece-wise linear systems?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Convert the following state model into canonical form

$$A = \begin{bmatrix} 1 & -4 \\ 3 & -6 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ -1 \end{bmatrix}, \quad C = [1 \ 0], \quad D = [0]$$

- Obtain the state space representation of the system

$$\frac{C(s)}{U(s)} = \frac{10(s+2)}{s^3 + 3s^2 + 5s + 15}$$

- Check the stability of the following discrete time system $F(z) = 2z^5 + 11z^4 + 24z^3 + 24z^2 + 9z + 2 = 0$
- Determine the describing function for the Backlash non linearity.
- Explain stable and unstable limit cycle with examples.

- f) A discrete time system is described by the difference equation

$$y(k+2) + 5y(k+1) + 6y(k) = u(k)$$

$$y(0) = y(1) = 0, u(k) = 1 \text{ for } k \geq 0$$

Find the output $y(k)$.

- g) A second order nonlinear system is described by

$$\ddot{x} + 25(1 + 0.1x^2) = 0$$

Using Delta method obtain the first five points in the phase plane for initial condition

$$x(0) = 1.8, \dot{x}(0) = -1.6$$

- h) Determine whether or not following quadratic form is positive definite

$$Q = 10x_1^2 + 4x_2^2 + x_3^2 + 2x_1x_2 - 2x_2x_3 - 4x_1x_3$$

- i) What is Ackermann's formula for determining state feedback gain matrix to design a state feedback controller. Prove this formula from first principle.

- j) Explain the following singular points:

Stable focus, unstable focus, stable node, unstable node, vortex and saddle points.

- k) State and prove Liapunov theorem for asymptotic stability of the system

$$\dot{X} = AX$$

- l) Show that the following linear autonomous model

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -k & -a \end{bmatrix} X$$

Is asymptotically stable if $a > 0, k > 0$.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 a) Investigate the controllability and observability of the following system: (8)

$$\dot{X} = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u, \quad Y = \begin{bmatrix} 0 & 1 \end{bmatrix} X$$

- b) A linear system is represented by (8)

$$\dot{x} = \begin{bmatrix} -6 & 4 \\ -2 & 0 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} x$$

Find the complete solution for $y(t)$ when $u(t) = 1, x_1(0) = 1, x_2(0) = 0$.

Determine the transfer function and draw a block diagram representing the system.

Q4 a) State and prove Shanon's sampling theorem. (8)

b) Explain the method of pole placement by state-feedback. Find the matrix $k = [k_1 \ k_2]$ which is called the state feedback gain matrix for the closed loop poles to be located at $-1.8 \pm j2.4$ for the original system governed by the state equation: (8)

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ 20.6 & 0 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U$$

Q5 a) A nonlinear system is governed by (12)

$$\frac{d^2x}{dt^2} + 8x - 4x^2 = 0$$

Determine the singular point s and their nature. Plot trajectory passing through $(x_1 = 2, x_2 = 0)$ without any approximation.

b) What are the limitations of phase plane analysis. (4)

Q6 a) Derive a Liapunov function for the system defined by (8)

$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = -3x_1^2 - 3x_2$$

And also check the stability of the system.

b) What do you mean by sign definiteness of a function? Check the positive definiteness (8)

of

$$V(\hat{X}) = x_1^2 + \frac{2x_2^2}{1+x_2^2}$$

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCL7E004

7th Semester Regular/Back Examination: 2024-25

SUBJECT: Cyber Law and Ethics

BRANCH(S): CST, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, IT

Time: 3 Hours

Max Marks: 100

Q.Code : R319

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What is Cyber Space?
- What is Cyber Law?
- What is the need for Cyber Law?
- What is cybercrime?
- What is Cyber Jurisprudence?
- Differentiate between doctrinal and non-doctrinal research.
- With a neat diagram show the hierarchy of courts.
- How does the Information Technology Act, 2000 address resolution of disputes associated with cybercrimes?
- What are the commandments for ethical computing?
- What are the ethical issues in the use of AI?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What is domain name? How DNS works? What are the various types of domain names? What are the technical and legal significance of domain names?
- Elaborate the Intellectual Property issues in cyber law?
- What is the necessity of corporate finance? Explain the regulations related to corporate finance.
- What are the amendments made by it act 2008?
- Explain the powers of cyber appellate tribunal
- Elaborate upon the concept of liability in light of Intellectual property right and its related issues with internet usage.
- Explain cyber terrorism with suitable illustrations.
- Explain the various challenges faced for cybercrime trials and investigations.
- Explain Internet Service Provider Liability with relevant provisions of law.

- j) Elaborate on international conventions and treaties governing E-Commerce.
- k) Should companies have policy for Internet usage for Employees? Give reason for your answer.
- l) What is Ecommerce? What are the following models of Ecommerce: B2B, B2C, C2B and C2C?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- | | | |
|-----------|---|-------------|
| Q3 | What are the various international legal instruments for preventing cybercrime? | (16) |
| Q4 | Explain the essentials of trademark in cyber spacing along with detailed account on the infringement and its remedy. | (16) |
| Q5 | Differentiate between private key and public key cryptography. Digital signature belongs to public or private key Cryptography? What is the provision for digital certificates in ITA 2000? | (16) |
| Q6 | What is the functional equivalent approach? Discuss how it is adopted in the Act with respect to the digital signature and electronic records. Do you think that the electronic records satisfy the test of reliability, traceability, and inalterability in the same way as the paper-based records? | (16) |

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Course: B.Tech
Sub_Code: REC7D001

7th Semester Regular/Back Examination: 2024-25
SUBJECT: Digital Image Processing
BRANCH(S): AEIE, CST, CSE, CSEAIME, ECE, ETC, EIE
Time: 3 Hours
Max Marks: 100
Q.Code: R405

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Can two different images have the same histogram? Justify your answer.
- How much memory is required for storing 512×512 image with 8 intensity levels?
- Who are the N_D neighbors of a pixel at (x, y) ?
- What model is used for restoration of images in presence of noise?
- What is the difference between enhancement and restoration?
- Obtain the max filter output of the following sub image.

139	5	55
41	225	199
200	150	176

- List the stages of digital image processing.
- Why is DCT important in image processing?
- Classify the image compression methods.
- Write the expression for 2D wavelet transform pair.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Give coordinates of $N_4(p)$ and $N_D(p)$ if point 'p' is at (150, 150) position.
- Find city block and chess board distance between points p (20, 25) and q (30, 35).
- Draw the RGB and HIS color models and compare them.
- What is the role of wavelet transform in image processing?
- How contrast stretching and intensity slicing is performed on an image?
- Obtain Histogram for the given image (4 x 4).

10	12	8	9
10	12	12	14
12	13	10	9
14	12	10	12

- What is the role of inverse filtering for image restoration?

- h) Derive a Wiener filter for image restoration and specify its advantages over inverse filter.
- i) Show the various techniques in frequency domain to enhance an image.
- j) Explain any one method of image restoration with necessary block diagrams.
- k) Write the expressions for Hadamard transform pairs.
- l) Explain the basic image compression methods using suitable block diagrams.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Perform histogram equalization for the image shown below. **(16)**

Gray Levels	0	1	2	3	4	5	6	7
No. of pixels	9	8	11	4	10	15	4	3

Q4 How low pass and high pass filtering is done in frequency domain, for a given image? Apply spatial high pass filter and low pass filter on the marked pixel in the given sub image. **(16)**

1	(2)	3
4	(3)	2
1	5	6

Q5 Distinguish the following terms and briefly explain each: i) Adjacency ii) Connectivity iii) Region and iv) Boundary. **(16)**

Q6 Explain the Huffman coding method of image compression citing a suitable example. **(16)**

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RED7E001

7th Semester Regular/Back Examination: 2024-25

SUBJECT: ENTREPRENEURSHIP DEVELOPMENT

BRANCH(S): AERO, AE, AME, AEIE, AUTO, BIOMED, BIOTECH, CHEM, C&EE, CIVIL, CST, CSEAI, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, EEE, ELECTRICAL, ECE, ELECTRONICS & C.E, ETC, EIE, ENV, IT, MANUTECH, MMEAM, MECH, MME, METTA, MINERAL, MINING, PT, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: R003

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- What is the full form of FSSAI?
- Who are business incubators?
- What is a startup?
- Who are copreneurs?
- What do you mean by entrepreneurial traits?
- What is content marketing?
- Who is a drone entrepreneur?
- What do you mean by startup cycle?
- What is zero defect zero effect?
- What is gross working capital?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- What are the various techniques used for creative ideas?
- Explain various types of unsecured loans with suitable examples.
- Elaborate the various causes of industrial sickness.
- Differentiate between Human Resource Development and Human Resource Mgmt.
- How do you increase the value of your customer?
- Differentiate between a dormant account and an inactive account.
- Accounting is the language of a business' explains with suitable examples.
- What are the various components of a business plan?
- What are differences between accelerators and incubators?
- Explain the various laws which are regulating the MSMEs in India.
- What are the pros and cons of 'Entrepreneur as a career'?
- Explain step-by-step the roadmap of revival plans for sick MSMEs.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Explain the various formalities required to set up a micro, small, and medium enterprises in the state of Odisha. (16)
- Q4** What do you mean by an Entrepreneurial environment? Explain the various categories of entrepreneurial environments. (16)
- Q5** Explain the various incentives and concessions given to entrepreneurs by the Govt. of India. Explain in detail. (16)
- Q6** What are the various marketing problems of MSMEs in India? Explain each point in details with suitable examples. (16)

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Total Number of Pages: 03

Course: B.Tech
Sub_Code: RCI7D003

7th Semester Regular/Back Examination: 2024-25
SUBJECT: Estimating, Costing and Professional Practice
BRANCH(S): Civil Engineering

Time: 3 Hours

Max Marks: 100

Q.Code: R323

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Write the difference between surface dressing and surface excavation.
- Calculate material for 20 mm thick plastering in wall for 100 sqm.
- Calculate material for neat cement flooring or skirting for 100 sqm having thickness = 1.5 mm
- Write the difference between earnest money deposit and security money deposit.
- How the following items of work are measured.
a) Plastering b) Brickwork in super structure c) Flooring d) Coursed rubble Masonry
- Write down the out-turn of a person working in the brickwork with cement mortar in foundation and plinth and Lime concrete (1:2:4) respectively.
- Write the difference between R chart and C chart.
- What do you understand by "the probability of finishing an activity within the scheduled time"?
- How the crashing cost effect the optimize time of project completion?
- Write the difference between PERT and CPM.

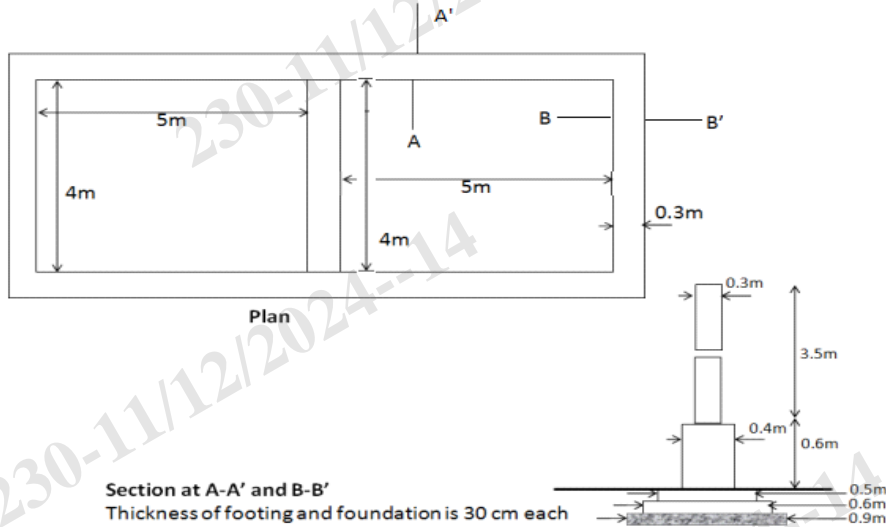
Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

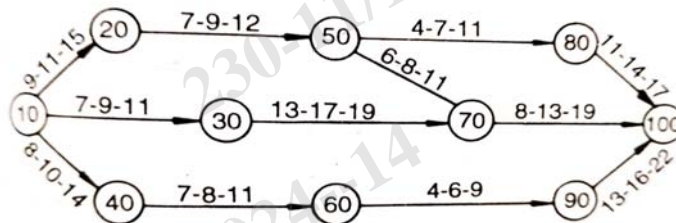
- Define different type of float and derive the relationship among them.
- Prepare the analysis of rate for cement concrete in proportion (1:2:4).
- Describe the method to Quality Control by Statistical Methods.
- Write the different construction safety requirement for construction industry.
- Prepare the analysis of rate for 12 mm thickness plaster (1:6).
- Distinguish between the general specification and detailed specification. Write down the general specifications for flooring, doors & windows in different class of Building.
- Describe about the types of estimates, their advantages and disadvantages

- h) Estimate the quantities of following items of work for a building as shown in figure using center line method.

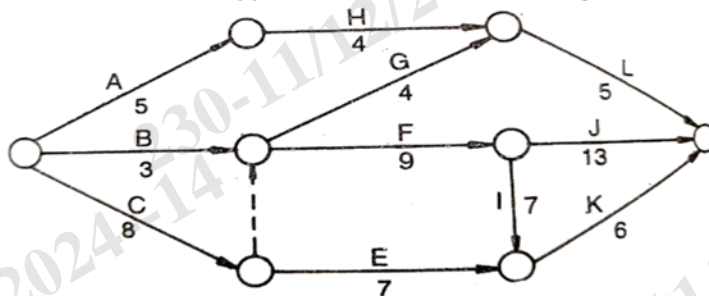
- Earthwork excavation in foundation
- Cement concrete in foundation
- Brickwork in foundations



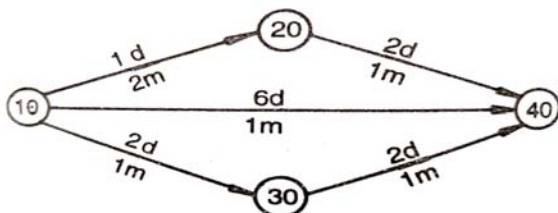
- Write the different content of a typical tender notice.
- Calculate the critical path of the following network using PERT.



- k) Calculate different type of float for the following network.



- Determine the aggregate resources requirement, period by period for the network given below. The figures over the arrow indicate the duration of the activities and figures below the arrow indicate requirement of mason for the project. Use resource smoothing technique to maintain the mason requirement of 2.



Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Consider a beam of clear length of 6 m, 3500 mm wide by 600 mm depth. The reinforcement details are as per following: (16)

At support 4-20 diameter bar at top and 2-20 diameter bar at bottom

At mid-span 2-20 diameter bar at top and 2-16 diameter and 2-20 diameter bars at bottom. The 8 mm dia stirrups are placed @ 180 mm c/c. Consider clear cover of 25 mm. Calculate the quantity of reinforcement in the beam

- Q4** Prepare a detailed estimate of a R.C.C. roof slab of 4 m clear span & 6 m long. R.C.C. work including centering & shuttering, steel reinforcement in detail shall be taken separately. Also prepare a schedule of bars. Bearing 150 mm & depth of slab 120 mm with clear cover 20 mm, assume other data. (16)

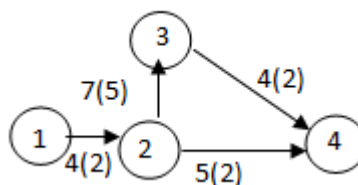
- Q5** The interdependencies of the activities are given below. Draw the network and determine the completing the project in 35 days (16)

Activity	A	B	C	D	E	F	G
Preceding activities	—	—	A	B	A	B	C & D
Succeeding activities	C & E	D & F	G	G	—	—	—

Activity time		Normal distribution function data	
Activities	Three time estimate	Z	P(%)
A	6-9-18	0.8	78.81
B	5-8-17	0.9	81.59
C	4-7-22	1.0	84.13
D	4-7-16	1.1	86.43
E	4-7-10	1.2	88.49
F	2-5-8		
G	4-10-22		

- Q6** The network for a project, the data for the duration and the costs of each activity are given in Figure and Table respectively. The indirect cost of the project is Rs. 2000 per week. Draw the time scaled version of the network at each stage of crashing (16)

Activity	Normal Duration (Weeks)	Normal cost (Rs)	Crash Duration (Weeks)	Crash Cost (Rs)
1-2	4	4000	2	12000
2-3	5	3000	2	7500
2-4	7	3600	5	6000
3-4	4	5000	2	10000



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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RIT7D001

7th Semester Regular/Back Examination: 2024-25

SUBJECT: Internet of Things

BRANCH(S): AERO, AE, AME, AEIE, AUTO, BIOMED, BIOTECH, C&EE, CIVIL, CST, CSE, CSIT, CSEAIME, EEE, ELECTRICAL, ECE, ELECTRONICS & C.E, ETC, EIE, IT, MANUTECH, MMEAM, MECH, MME, METTA, MINERAL, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: R048

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions (2 x 10)

- Why do IoT systems have to be self-adapting and self-configuring capabilities?
- What are the benefits of using a M2M architecture?
- What are the architectural constraints of REST?
- Mention the role of cloud computing in IoT.
- What is the function of YANG modules in device management?
- Write a Python program for blinking LED using Raspberry Pi GPIO pin 18.
- What are the key elements of NFV architecture?
- What is the use of SPI and I2C protocol on Raspberry Pi?
- How is Raspberry Pi different from a desktop computer?
- Write the difference between Raspberry Pi and Beaglebone Black.

Part-II

Q2 Only Focused-Short Answer Type Questions (Answer Any Eight out of Twelve) (6 x 8)

- Discuss the advantages of using Python for IoT development. Why is Python a popular choice for IoT applications, and what features make it suitable for tasks like data collection, processing, and device communication?
- Compare and contrast Bluetooth Low Energy (BLE) with traditional Bluetooth technology. Why is BLE essential for IoT applications, and what are its main benefits in terms of power consumption and connectivity?
- Explain the IoT level-3 architecture.
- What is the difference between SDN and NFV?
- Describe the hardware and features of the Raspberry Pi board. How do its specifications make it suitable for IoT applications?
- Explain the key principles of Industry 4.0 and discuss how these concepts transform traditional industries into smart, connected systems.
- What is the difference between machines in M2M and things in IOT? Explain with examples.
- Draw the flow diagram of different steps related to IoT designing methodology.

- i) Define the role of Android / IOS App Development tools in IoT.
- j) How Big Data can be used in IoT? Explain.
- k) Evaluate the Raspberry Pi against other IoT development boards such as pcDuino, BeagleBone Black, and Cubieboard in terms of processing power, GPIO options, and ease of development.
- l) Discuss the use cases related to NFV.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Draw the block diagram of the RFID reader and explain the operation. (8)
- b) What is IP addressing? Explain its types in detail and which type of addressing is best suited for IoT devices. (8)
- Q4** Concerning agriculture as a case study, describe the operational and functional view with a neat diagram while designing an IoT-based system. (16)
- Q5** What are the different layers of IoT protocols? Explain the function of each layer. (16)
- Q6** Construct the design of a smart home with Raspberry Pi and other hardware devices with a neat sketch. (16)

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: REI7D003

7th Semester Regular/Back Examination: 2024-25

SUBJECT: Mechatronics

BRANCH(S): AUTO, EEE, ELECTRICAL, ECE, ETC, MANUTECH

Time: 3 Hours

Max Marks: 100

Q.Code: R381

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What is Mechatronics? What are the key components of a Mechatronics system?
- Define the difference between NPN and PNP transistors.
- How is the Laplace Transform used to solve differential equations?
- How do sensors and actuators contribute to a Mechatronics system?
- What do you understand by passive and active mechanical components? Provide examples.
- Convert decimal number 24 into equivalent octal and hexadecimal number.
- What are universal gates, and why are they called "universal"?
- What are the advantages of PLC over a relay control system?
- What are the differences between the microprocessor and microcontroller?
- List some real-world applications of Mechatronics in different industries.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Provide a brief explanation of a measurement system with a neat block diagram.
- Differentiate between Distributed Control Systems (DCS) and Centralized Control Systems (CCS).
- Describe how a BJT can be used as an amplifier and explain its operation with a practical circuit.
- Illustrate the working principle of Half and Full wave rectifier using neat sketches.
- What is the Laplace Transform of 1? State the linearity property of the Laplace Transform.
- How are shift registers used to perform serial-to-parallel and parallel-to-serial conversion? Provide examples.
- Discuss the applications of universal gates, flip-flops, and counters in digital electronics.

- h) Describe the behavior of an inductor in an AC circuit and how it affects the phase relationship between voltage and current.
- i) Briefly explain the operation of an electric motor using suitable diagrams.
- j) What do you mean by subroutines and nested subroutines? What are their uses?
- k) Briefly explain the working principle of piezoelectric pressure sensor.
- l) Explain the principle of operation of a thermocouple and how it generates a voltage based on the temperature difference between two junctions.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Describe the working of a master-slave JK flip-flop with a neat circuit diagram and suitable truth tables. How does a JK flip-flop differ from an SR flip-flop? **(16)**
- Q4** Define Boolean Algebra and its importance in digital logic design. Explain the basic operations (AND, OR, NOT) and their corresponding laws (commutative, associative, distributive, etc.). Simplify the following Boolean expression using Boolean laws:
$$Y = A \cdot B + A \cdot \bar{B} + B \cdot \bar{A}$$
 (16)
- Q5** What is a ladder diagram in PLC programming? Draw the ladder diagram and PLC program for following logic gates (i) OR (ii) NAND (iii) NOR (iv) XOR **(16)**
- Q6** Describe the working principle of thermistors and explain how they are used to measure temperature. Discuss the difference between NTC (Negative Temperature Coefficient) and PTC (Positive Temperature Coefficient) thermistors, and outline their applications. **(16)**

Registration No.:

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Total Number of Pages: 02

Course: B.Tech

Sub_Code: REI6D001

7th Semester Regular/Back Examination: 2024-25

SUBJECT: Micro Electronic Mechanical Systems

BRANCH(S): MECH

Time: 3 Hours

Max Marks: 100

Q.Code: R349

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What is wafer bonding, and why is it important in MEMS fabrication?
- How does scaling affect the surface-to-volume ratio in MEMS devices?
- What are the common methods of thin film deposition?
- Why is thin film deposition critical in microelectronics?
- What do you mean by a wafer? What kind of material is commonly used for wafer?
- What is the role of spin-coating and how is it performed?
- What are the main applications of microlenses in MEMS technology?
- What is the significance of optical gyroscopes in navigation systems?
- How can micromirrors be used in optical switching applications?
- What materials are commonly used in piezoresistive pressure sensors?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Compare bulk micromachining and surface micromachining in terms of their processes, applications, and limitations.
- What is RF MEMS, and how does it differ from conventional MEMS? Enlist some application of RF MEMS.
- Explain the role of sacrificial layers in surface micromachining and how they are used to create free-standing structures in MEMS devices?
- What is the difference between wet and dry etching processes?
- Analyze how scaling impacts the performance of MEMS actuators, focusing on electrostatic and piezoelectric actuation. Provide examples to illustrate your answer.
- Discuss the different methods of doping in semiconductors (e.g., diffusion and ion implantation). Explain how doping affects the electrical properties of semiconductors.
- What is a piezoresistive pressure sensor and how does it work?

- h) Describe the design and working mechanism of a MEMS capacitive accelerometer. Discuss how it detects changes in acceleration.
- i) Discuss the fabrication techniques used to manufacture microlenses and micromirrors in MEMS.
- j) How does the quality factor (Q-factor) affect the performance of RF MEMS resonators?
- k) Analyze the role of micromirrors and microlenses in emerging technologies such as LiDAR (Light Detection and Ranging) systems and AR/VR (Augmented Reality/Virtual Reality) displays.
- l) What do you understand from microfluidic system? Enlist important building blocks of microfluidic systems.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- | | | |
|-----------|--|-------------|
| Q3 | Explain the process of thin film deposition, highlighting physical vapor deposition (PVD), and chemical vapor deposition (CVD). Compare their advantages and limitations. | (16) |
| Q4 | Describe the LIGA process in detail, including its steps such as lithography, electroplating, and molding. Discuss how LIGA enables the fabrication of high-aspect-ratio microstructures and its advantages in producing microtools, sensors, and actuators. | (16) |
| Q5 | Analyze the advantages and limitations of using RF MEMS in phased array antennas. Explain how RF MEMS are used in beam steering and signal processing in phased array antennas with suitable diagrams. | (16) |
| Q6 | Write short answer on following:
(a) X-ray lithography
(b) PECVD | (16) |

Registration No.:

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RME7D005

7th Semester Regular/Back Examination: 2024-25

SUBJECT: Refrigeration and Air Conditioning

BRANCH(S): AG, AE, MECH

Time: 3 Hours

Max Marks: 100

Q.Code: R207

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What is the Coefficient of Performance (COP) of a reversed Carnot cycle, and how is it mathematically expressed in terms of the temperatures of the heat source and sink?
- Sketch and explain the P-h diagram for a saturated vapor compression cycle, labeling key processes and state points.
- Draw and explain the T-s diagrams for vapor compression cycles when the vapor after compression is superheated.
- What is the function of a flash intercooler in a refrigeration system, and how does it enhance the system's performance?
- What are the functions of the rectifier and analyzer in an absorption system?
- What is meant by Peltier cooling?
- What is an azeotrope, and why is it significant? Provide some examples.
- What is the commonly used refrigerant in domestic refrigerators?
- List two-ways of removing moisture from air.
- How can you get the dew point of the air corresponding $T_{db} = 303 \text{ K}$ and $\phi = 50\%$?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What is an air-refrigeration system, and where is it typically used?
- What are sub-cooling and superheating, and how do they impact the performance of a refrigeration system? Explain with the help of P-h and T-s diagrams.
- What is the difference between wet and dry compression in a refrigeration cycle?
- Which components of a simple vapor-absorption system replace the compressor in a vapor-compression system? Explain with a sketch.
- What is thermoelectric refrigeration, and what is the principle behind its working?
- How can a thermoelectric refrigerator be used as a heat pump?
- Why are halocarbon refrigerants commonly used?

- h) What is the difference between primary and secondary refrigerants?
- i) What are the different sources of cooling load in a room?
- j) What factors should be considered when selecting a refrigerant for a system?
- k) Sketch a 'comfort chart' and indicate the 'comfort zone' on it. Explain its significance in maintaining indoor comfort.
- l) What is summer air conditioning, and how is it explained using a psychrometric chart?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** A two-stage ammonia plant is to achieve a minimum temperature of -30°C when the ambient is at 40°C . The intermediate pressure is 3.413 bar. Obtain COP and tonnage of the system, if the refrigerant flow through evaporator is 0.45 kg/s. The flash intercooler is employed. **(16)**
- In the above case the refrigerant at the end of compression from the LP cylinder is cooled to 35°C before it enters the flash intercooler. Sketch system (flow diagram) and the p-h diagram giving relevant property values. Find the improvement in COP over the former. Also get COP and capacity for single-stage compression.
- Q4** In a vapour compression refrigeration System using R-22, the evaporator pressure is 1.4 bar and the condenser pressure is 8 bar. The refrigerant leaves the condenser sub-cooled to 30°C . The vapour leaving the evaporator is dry and saturated. The compression process is isentropic. The amount of heat rejected in the condenser is 13.42 MJ/min. Determine: (a) Refrigerating effect in kJ/kg; (b) Refrigerating load in TR; (c) Compressor input in kW; and (d) COP. Show the cycle on T-s and P-h diagram. **(16)**
- Q5** Compare the working principles of the NH_3 -water and Li-Bromide water vapor absorption systems with sketches. Derive the expression for the maximum COP of a vapor absorption system. **(16)**
- Q6** In an air conditioner the outdoor air (at 40°C DBT and 40 % RH) is mixed with return (from room) air (at 25°C DBT and 50 % RH) in the ratio of 3:2 before entering the cooling coil. The by-pass factor for the cooling coil is 0.25 and the room sensible heat factor (RSHF) is 0.8. Air flow rate (total) through the cooling coil is 8 kg/s. Determine: (i) ADP, (ii) Condition of air at inlet and exit of the cooling coil, (iii) Tonnage of the plant, and (iv) Rate of condensation. **(16)**

Registration No.:

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCI7D006

7th Semester Regular/Back Examination: 2024-25
SUBJECT: Water Resource Engineering
BRANCH(S): C&EE, CIVIL
Time: 3 Hours
Max Marks: 100
Q.Code: R110

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What type of rainfall data is recorded in the Tipping-bucket type rain gauge and Weighing-bucket type rain gauge?
- How is the consistency of precipitation data tested?
- How is the storage volume of a reservoir calculated from a mass curve?
- What is effective rainfall, and how is it determined in hydrograph analysis?
- What is flood routing, and why is it necessary in hydrology?
- How does frequency analysis help in flood estimation?
- What is critical depth in open channel flow?
- A hydraulic jump occurs in a horizontal rectangular channel with a flow depth of 2m and 3m before and after the jump. Calculate the energy dissipation head.
- The Froude number of a flow in a rectangular channel is 0.73. If the depth of flow is 1.50 m, find the specific energy.
- Differentiate supercritical and subcritical depth.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Describe the depth-area-duration relationships in precipitation and their application in hydrological studies.
- Explain ϕ -index and W-Index. The average rainfall over 45 ha of a watershed for a particular storm is given below. The volume of runoff from this storm was determined as 2.25 ha-m. Determine w-index and ϕ -index.

Time (hr)	0	1	2	3	4	5	6	7
Rainfall (cm)	0	0.5	1.0	3.25	2.5	1.5	0.5	0

- What is the SCS-CN method for estimating runoff volume? Describe how it is applied in hydrological modeling.
- Discuss the use of flow duration curves and flow-mass curves in streamflow analysis.
- Explain the factors affecting a runoff hydrograph and how these factors are used to interpret hydrographs.
- What is base flow separation, and how is it performed in hydrograph analysis?

- g) What is the return period, and what is its significance of it?
A one-day rainfall of 20.0 cm at place X was found to have a period of 100 years. Calculate the probability that a one-day rainfall of magnitude equal to or larger than 20.0 cm:
(i) It will not occur at station X during the next 50 years.
(ii) It will happen in the next year.
- h) Define drought and classify it based on different characteristics.
- i) Define uniform flow in open channels and explain the Chezy and Kutter equations for flow estimation.
- j) Describe gradually varied flow in open channels and the factors that affect its behavior.
- k) Explain the concept of non-uniform flow and the factors that influence it.
- l) In a 4.0-m wide rectangular channel ($n = 0.017$), the bed slope is 0.0006. When the channel is conveying 50 m³/s of flow, estimate the nature of GVF profiles at two far away sections, P and R, in this channel where the depth of flow is measured as 1.6 m and 2.1 m, respectively.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 (a)** Explain the maximum intensity/depth-duration-frequency relationship in relation to rainfall events. (8)

- (b)** The following are the ordinates of the hydrograph of flow from a catchment area of 800 km² due to a 6-h rainfall. Derive the ordinates of the 6-h unit hydrograph. Make suitable assumptions regarding the base flow. (8)

Time (h)	0	6	12	18	24	30	36	42	48	54	60	66	72
Discharge (m ³ /s)	40	65	215	360	400	350	270	205	145	100	70	50	42

- Q4 (a)** Explain the Sequent Peak Procedure and its use in reservoir planning and flood control. (8)

- (b)** What are synthetic unit hydrographs, and how are they used in flood estimation? (8)

- Q5 (a)** Describe channel routing in the context of flood management and explain its importance in hydrological studies. (8)

- (b)** Determine the dimensions of a concrete-lined ($n = 0.012$) trapezoidal channel of efficient proportions to carry a discharge of 12.5 m³/s. The bed slope of the channel is 0.0005 and side slope = 3:4. (8)

- Q6 (a)** What is the most economical cross-section in open channel flow design, and how is it determined? (8)

- (b)** What is a hydraulic jump in open channel flow, and how does it affect water flow and energy dissipation? (8)

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Total Number of Pages: 03

Course: B.Tech
Sub_Code: REL7D001

7th Semester Regular/Back Examination: 2024-25

SUBJECT: Advanced Control System

BRANCH(S): EEE, Electrical, EIE

Time: 3 Hours

Max Marks: 100

Q.Code: R090

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Derive the Z transform of the following
 $X(1) = 2$; $X(4) = -3$; $X(7) = 8$ and all other samples are zero. Define the stability of discrete time function.
- State Kalman's test for controllability.
- What is the basis of choosing state variables of a system?
- What is the State Transition Matrix and what are its significances?
- Explain Jump resonance in nonlinear closed loop system.
- If the eigen values of a system are -2 , -4 and -5 , write down the state transition matrix.
- What are the conditions for asymptotic stability at the origin?
- Use Jury's test to show that the two roots of the digital system $F(z) = z^2 + z + 0.25 = 0$ are inside the circle.
- What do you mean by sign definiteness of a function?
- What do you mean by piece-wise linear systems?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Convert the following state model into canonical form
- Obtain the state space representation of the system
$$\frac{C(s)}{U(s)} = \frac{10(s+2)}{s^3 + 3s^2 + 5s + 15}$$
- Check the stability of the following discrete time system
 $F(z) = 2z^5 + 11z^4 + 24z^3 + 24z^2 + 9z + 2 = 0$
- Determine the describing function for the Backlash non linearity.
- Explain stable and unstable limit cycle with examples.

- f) A discrete time system is described by the difference equation

$$y(k+2) + 5y(k+1) + 6y(k) = u(k)$$

$$y(0) = y(1) = 0, u(k) = 1 \text{ for } k \geq 0$$

Find the output $y(k)$.

- g) A second order nonlinear system is described by

$$\ddot{x} + 25(1 + 0.1x^2) = 0$$

Using Delta method obtain the first five points in the phase plane for initial condition

$$x(0) = 1.8, \dot{x}(0) = -1.6$$

- h) Determine whether or not following quadratic form is positive definite

$$Q = 10x_1^2 + 4x_2^2 + x_3^2 + 2x_1x_2 - 2x_2x_3 - 4x_1x_3$$

- i) What is Ackermann's formula for determining state feedback gain matrix to design a state feedback controller. Prove this formula from first principle.

- j) Explain the following singular points:

Stable focus, unstable focus, stable node, unstable node, vortex and saddle points.

- k) State and prove Liapunov theorem for asymptotic stability of the system

$$\dot{X} = AX$$

- l) Show that the following linear autonomous model

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -k & -a \end{bmatrix} X$$

Is asymptotically stable if $a > 0, k > 0$.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Investigate the controllability and observability of the following system: (8)

$$\dot{X} = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u, \quad Y = \begin{bmatrix} 0 & 1 \end{bmatrix} X$$

- b) A linear system is represented by (8)

$$\dot{x} = \begin{bmatrix} -6 & 4 \\ -2 & 0 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} x$$

Find the complete solution for $y(t)$ when $u(t) = 1, x_1(0) = 1, x_2(0) = 0$.

Determine the transfer function and draw a block diagram representing the system.

Q4 a) State and prove Shanon's sampling theorem. (8)

b) Explain the method of pole placement by state-feedback. Find the matrix $k = [k_1 \ k_2]$ which is called the state feedback gain matrix for the closed loop poles to be located at $-1.8 \pm j2.4$ for the original system governed by the state equation: (8)

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ 20.6 & 0 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U$$

Q5 a) A nonlinear system is governed by (12)

$$\frac{d^2x}{dt^2} + 8x - 4x^2 = 0$$

Determine the singular point s and their nature. Plot trajectory passing through $(x_1 = 2, x_2 = 0)$ without any approximation.

b) What are the limitations of phase plane analysis. (4)

Q6 a) Derive a Liapunov function for the system defined by (8)

$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = -3x_1^2 - 3x_2$$

And also check the stability of the system.

b) What do you mean by sign definiteness of a function? Check the positive definiteness (8)

of

$$V(\hat{X}) = x_1^2 + \frac{2x_2^2}{1+x_2^2}$$

Registration No.:

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Total Number of Pages: 02

B.Tech
RCS7D002

7th Semester Regular/Back Examination: 2024-2025

Cyber Security and Privacy

BRANCH(S): CSE

Time: 3 Hours

Max Marks: 100

Q.Code : R097

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Who and when coined the word cyberspace?
- What are the various cybercrimes against individuals?
- What are the different types of cybercriminals?
- How is a worm different from a trojan horse from cyber-attack point of view?
- What is cyber security?
- What is hacking? What are the various purposes of hacking?
- What do you mean by computer sabotage? What is the purpose of it?
- What are the amendments done in ITA2008?
- What is identity theft? Explain with examples.
- What is cryptographic hash function? In Blockchain which hash algorithm is used.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What are viruses in cyberworld? How they get disseminated? Explain with diagrams.
- What do you mean by authentication? Explain the terms prover and verifier? What are the various authentication methods? Explain dictionary attack on passwords and give one approach how it can be prevented.
- What is intrusion? What are the tasks of IDS? Classify the IDS based on their functionality and differentiate them.
- What is access control in the Operating Systems? How access control rights are represented in an Operating System? Explain with an example the terms ACL, Windows registry, Subject, Object with respect to OS Security.
- Explain the SSL protocol at the transport layer of the network.
- What are the main functions of WS-Security? Also explain the terms: WS-Trust and WS-Security Policy.
- What is SQL Injection vulnerability, explain with an example? How can it be remedied?

- h) What are the security issues of cloud computing? What measures should be taken by cloud service provider to secure its clients?
- i) What kind of attacks are possible on mobile phones? What counter measures need to be provided to secure your cell phone.
- j) What is the cybersecurity best practices that should be followed by organizations to mitigate malware threats?
- k) What is digital forensic? What are the various branches of digital forensic? What tools do the forensic examiners use for investigation?
- l) What is IPR act in India? What are the various types of IPR? Why IPR is important?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** What is firewall? How are firewalls different from IDS? What are the different types of firewalls available in the market? With a neat diagram explain the placement of a firewall in an organization. **(16)**
- Q4** What is Information Technology Act? Discuss its aims and objectives. **(16)**
- Q5** Explain the importance of strong documentation in cyberforensics profession. Highlight the keys steps to be performed in solving a computer forensic case. **(16)**
- Q6** What are the different components of wireless network? How can wireless networks be compromised? Differentiate between WEP and WEP2. Differentiate between WAPKitting and WAPJacking. **(16)**

Registration No.:

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RME7D001

7th Semester Regular/Back Examination: 2024-25
SUBJECT: Power Plant Engineering
BRANCH(S): MECH
Time: 3 Hours
Max Marks: 100
Q.Code: R104

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- a) What is the primary purpose of a steam generator?
- b) What is the function of an air-preheater?
- c) What is a sub critical boiler?
- d) How do natural circulation and forced circulation differ from each other?
- e) What is the purpose of an economizer?
- f) What is super saturated flow in the context of nozzles?
- g) What is meant by nozzle governing?
- h) What do you mean by mass defect and binding energy?
- i) What are peak load and peak load plants?
- j) What is the significance of incremental rate for a power plant?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- a) What are the key features of a fire tube boiler, and how does it differ from a water tube boiler?
- b) What are boiler mountings and accessories, and what are their functions?
- c) How are boiler performance calculations carried out, and what parameters are considered?
- d) What do critical pressure and choked flow refer to in the context of nozzles?
- e) Can you illustrate the velocity diagrams for impulse blading?
- f) What is the operating principle of a cooling tower?
- g) How is the performance of a steam condenser calculated?
- h) Describe the main features of a CANDU-type reactor with a sketch.
- i) Explain how energy is released by nuclear fission. What is mass defect?
- j) What are the waste disposal methods and safety measures in nuclear power plants?
- k) What are the advantages of using a load duration curve in power plant design?
- l) What are the methods used to determine the depreciation of a power plant?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** What are the key principles of pulverized coal combustion systems and the fundamental concepts of fluidized bed combustion? **(16)**
- Q4** A steam turbine is to develop 8 MW at 5000 rpm for driving a compressor. The steam enters at 40 bar, 500 °C and exhaust at 0.1 bar. The internal efficiency of the turbine is 0.85 and its mechanical efficiency is 0.96. Estimate (a) the number of impulse stages required, if similar impulse stages are used throughout, (b) the nozzle height for the first stage with full admission. Assume nozzle efficiency as 0.92, nozzle angle 15°, limiting blade velocity of 300 m/s, and blades operating at maximum efficiency. **(16)**
- Q5** Describe a high-level jet condenser. Why is a condenser needed for a steam power plant? Define vacuum efficiency and condenser efficiency. **(16)**
- Q6** Explain the characteristic features of Pressurized water Reactor (PWR). What is the function of the pressurizer? How is the power output of a nuclear reactor controlled? **(16)**

Registration No.:

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Total Number of Pages: 01

B.Tech
REL7D003

7th Semester Regular/Back Examination 2024-25

SMART GRID

CSE, EEE, EE, ELECTRICAL & CE, IT

Max Marks: 100

Time: 3 Hours

Q.CODE : R208

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right-hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- What is a smart grid?
- What are Intelligent Electronic Devices (IED)s? Briefly explain about its importance.
- Briefly explain the importance of GIS in smart grid applications.
- What is distributed generation? Briefly explain.
- Name two storage systems used in Smart Grid.
- Distinguish between Distributed Generation and Conventional Generation.
- State the basic difference between a grid connected microgrid and isolated microgrid.
- What is a Fuel-cell? Briefly Explain.
- What is Plug-in Hybrid Electric Vehicle? Briefly explain.
- What is Power Quality Audit? Briefly Explain.

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Write the various opportunities and challenges of smart grid.
- Explain about Wide Area Measurement System (WAMS).
- Explain the working of a smart meter using its Functional Block Diagram.
- What is Real Time Pricing? State its importance in smart grid.
- Explain details about feeder automation in smart grid.
- Explain about features of smart meters.
- Explain the various functions of substation automation system.
- Explain the importance FACTS devices in Smart Grid.
- What is the principle of operation of Compressed Air Energy Storage. Explain with neat diagrams.
- What are the advantages and disadvantages of Distributed Generation?
- Explain the different storage system used in smart grid.
- Write a short note on smart home management system.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Discuss about architecture and functions of Smart Grid. Compare a Smart Grid power system with traditional power system. **(10+6)**
- Q4** How is a Micro Grid functionally different from a Smart Grid? Explain about protection and control of micro-grid. **(6+10)**
- Q5** Explain the fundamentals of phasor measurement unit and their applications in power systems. How is PMU different from SCADA? **(10+6)**
- Q6** Explain the importance of power quality in smart grid and about Power Quality Conditioners for micro-grid. Explain Web based Power Quality monitoring. **(4+6+6)**

Registration No.:

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCS7D007

7th Semester Regular/Back Examination: 2024-25

SUBJECT: SOFT COMPUTING

BRANCH(S): AEIE, CIVIL, EEE, ELECTRICAL, ECE, ETC, ENV, MECH, METTA, MINING

Time: 3 Hours

Max Marks: 100

Q.Code: R367

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What are fuzzy relations? Give an example.
- What is defuzzification? State its purpose in fuzzy logic.
- What is the difference between a crisp set and a fuzzy set?
- Define a single-layer neural network and its basic structure.
- What is the purpose of weight learning in neural networks?
- Differentiate between a single-layer and a multi-layer perceptron.
- What is evolutionary programming? How does it differ from genetic algorithms?
- What is elitism in genetic algorithms, and why is it important?
- Define the term "fitness landscape" in the context of evolutionary algorithms.
- What are the advantages of using genetic algorithms for solving optimization problems?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What are the basic operations of a fuzzy set? Explain with examples.
- Describe the process of fuzzy logic control and its application in real-world systems.
- Discuss Zadeh's compositional rule of inference in fuzzy systems.
- Explain the concept of fuzzy inference and its role in fuzzy logic systems.
- Explain the working of the Perceptron algorithm. What are its limitations?
- Discuss the generalized delta rule and its significance in neural network training.
- What are Kohonen self-organizing maps (SOMs)? Explain their working and applications.
- Explain the architecture and working of adaptive neuro-fuzzy inference systems (ANFIS).
- Discuss the working of the simulated annealing algorithm. Explain its key components, such as temperature control, acceptance probability, and cooling schedule, with an example.

- j) Describe the process of acceptance probability in simulated annealing. Explain how the probability function helps avoid local optima and improve the search for global optima.
- k) Explain the integration of local search methods with genetic algorithms. How does the inclusion of a local search mechanism help in enhancing the performance of the genetic algorithm?
- l) Explain the differences between genetic algorithms and genetic programming. Discuss their respective applications and how they are used to solve different optimization problems.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

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| Q3 | Discuss the Mamdani and Takagi-Sugeno fuzzy inference systems. Compare their structure, working, and applications in detail. | (16) |
| Q4 | Explain the functioning of Recurrent Neural Networks (RNNs). Give a detailed discussion of their architecture and one specific application of your choice. | (16) |
| Q5 | Discuss the concept and working of genetic algorithms. Explain the steps of a genetic algorithm (selection, crossover, mutation) with appropriate examples and discuss their applications in optimization problems. | (16) |
| Q6 | Discuss how combining genetic algorithms with other optimization methods improves performance and solves complex optimization tasks with suitable examples. | (16) |