2024.11.16 20:23

Sujit Kumar

UESC — Math

(GE – 3 / DSC – C)

2021-24

Time : 3 hours

Full Marks : 100

Pass Marks : 40

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from both the Groups as directed.

Group – A

(Compulsory)

1. Answer the following questions : 1×10 = 10

   (a) Define Bounded Sequence.

   (b) Define monotonic Sequence.

   (c) Define Cauchy Sequence.

   (d) Define divergent series.

   (e) Define identity element of a group.

   (f) Define coset of a subgroup.

(g) Define linear differential equation.

(h) Define singular solution.

(i) Define total differential equation.

(j) What do you mean by binary operations ?

2. Prove that the series $1 + 4 + 7 + \ldots\ldots$ is divergent. 5

3. If H is any subgroup of a group G, then prove that $HH = H$. 5

Group – B

Answer any **four** questions of the following :

4. (a) State and prove Pringsheim's Theorem. 10

(b) Test the convergence of the series whose general term is $\left(1-\frac{1}{n}\right)^{n^2}$ 10

5. (a) Prove that the series $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots.+\frac{1}{n^2}$ is convergent. 10

(b) Determine the convergency of the series $\frac{1}{4}+\frac{1.3}{4.7}+\frac{1.3.5}{4.7.10}+\frac{1.3.5.7}{4.7.10.13}+\ldots..$ 10

6. (a) Show that the set $G = \{a+b\sqrt{2} : a, b \in Q\}$ is a group with respect to addition. 10

(b) If H_1 and H_2 are any two subgroups of a group G, then prove that $H_1 \cap H_2$ is also a subgroup of G. 10

7. (a) Prove that any two right (left) cosets of a subgroup are either disjoint or identical. 10

(b) If a finite group of order n contains an element of order n, them prove that the group must be cyclic. 10

8. (a) Solve the differential equation $(y+1)\,p - xp^2 + 2 = 0$. 10

(b) Prove that the system of Parabolas $y^2 = 4a(x + a)$ is self orthogonal. 10

9. (a) Solve the differential equation :

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{zx}$$ 10

(b) Solve :

$$3x^2dx + 3y^2dy - (x^3 + y^3 + e^{2z})dz = 0.$$ 10

Sujit Kumar

UESE — Phy
(GE – 3)

2021-24

Time : 3 hours

Full Marks : 75

Pass Marks : 30

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Answer from both the Groups as directed.

Group – A

(Compulsary)

1. Answer **all** questions of the following : 1×10 = 10

(a) Write the statement of Zeroth law of Thermodynamics.

(b) Write the relation between CP and CV.

(c) What is the dimension of Thermal Conductivity ?

(d) What is the value of Solar Constant ?

(e) Write the equation for an ideal gas for n-molecules.

(f) Write expression for mean free path.

(g) State the Wien's Displacement law.

(h) Name the scientist who stated that good absorbes are good emitters.

(i) The First law of Thermodynamics is a special case of _____.

(ii) The internal energy of an ideal gas depends only on _____.

2. State the law of Equipartition of Energy. 5

Group – B

Answer any **four** questions of the following : 15×4 = 60

3. Define Entropy. Show that the entropy of a perfect gas remains constant in a reversible process and increases in irreversible process.

4. State Carnot's theorem and deduce it from the Second law of Thermodynamics.

Sujit Kumar

5. Deduce Maxwell-Boltzmann distribution law of velocities.

6. What is Black body radiation ? State and prove Stefan's Law.

7. Discuss Fermi Dirac distribution law and show that $n_i = \frac{g_i}{[e^{\alpha+\beta E_i}]+1}$.

8. Write short notes on any two of the following :
   (a) Mean Free Path
   (b) Gibb's Function
   (c) Electron Gas
   (d) Plank's Law

❖

Sujit Kumar.

UESC — CA
(CC – 7)

2021-24

Time : 3 hours

Full Marks : 60

Pass Marks : 24

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Group – A

1. Select the most appropriate option from the following : 1×10 = 10

   (a) A _____ is the physical path over which a message travels.

   (i) Path

   (ii) Medium

   (iii) Protocol

   (iv) Route

(b) A _____ set of rules that governs data communication.

(i) Protocols

(ii) Standards

(iii) RFCs

(iv) Servers

(c) Two devices are in network if :

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(ii) A process is running on both devices

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(d) In TDM, slots are further divided into :

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(f) In _____ systems, resources are allocated on demand.

(i) Packet switching

(ii) Circuit switching

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(g) Multiplexing is used in :

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(iii) Data switching

(iv) Packet and Circuit switching

(h) Which of the following tasks is not done by data link layer ?

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(iv) Channel coding

(i) DNS database contains :

(i) Name server records

(ii) Hostname-to-address records

(iii) Hostname aliases

(iv) All of the above mentioned

(j) A device operating at network layer is called :

(i) Router

(ii) Equalizer

(iii) Bridge

(iv) Repeater

2. What is Computer network ? How computer networks are classified ? 5

Group – B

Answer any **three** questions of the following :

3. (a) What is network protocol ? Explain OSI reference model with neat diagram. 7

   (b) What is multiplexing ? Write the difference between Frequency division and Time division multiplexing. 8

4. (a) What is switching technique ? Explain packet switching technique with neat diagram. 7

   (b) Write short notes on the following : 8

   (i) WWW

   (ii) HTTP protocol

5. (a) Explain CSMA / CD 7

   (b) Explain different error detection technique in computer network. 8

6. (a) What is Bridge ? Explain the advantages of bridge in computer network. 7

(b) Explain stop and wait ARQ and Go-back-n ARQ techniques with neat diagram. 8

7. Write short notes on any **two** of the following : $7\frac{1}{2} \times 2 = 15$

(a) Serial and Parallel transmission

(b) Pulse code modulation

(c) IP Protocol

Sujit kumar

UESC — CA
(CC – 6)

2021-24

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   (ii) Real time

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(iii) None of these

(iv) Both (i) and (ii)

(f) To access the services of the operating system, the interface is provided by the :

(i) Library

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(i) The size of virtual memory is based on which of the following :

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Group – B

Answer any **three** questions of the following :

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   (c) Describe the directory structure of LINUX or UNIX Operating System. 5

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   (b) What are Concurrent Process ? How is interprocess communication accomplished ? 5

   (c) Differentiate between Time Sharing and Real Time Operating System. 5

5. (a) Write any two methods used for allocating disk space. 5

(b) Differentiate between Pre-emptive and Non-premptive Scheduling. Explain with example. 5

(c) What are the five (5) major activities of an Operating System in regard to Process Management 5

6. (a) Consider the following set of processes with the length of the CPU burst time given in milliseconds.

Process	Burst time	Priority
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The processes are assumed to have arrived in the order P1, P2, P3, P4, P5 all at time O. Calculate the turn around time, wait time and response time with respect to FCFS, SJF and RR (Quantum = 1) Scheduling. 8

(b) What is deadlock ? What are the necessary Conditions for dead lock ? Describe about deadlock prevention and avoidance. 7

7. Write short notes on any **three** of the following : 5×3 = 15

(a) Paging

(b) Segmentation

(c) Virtual Memory

(d) Security and Authentication

(e) Process-State Transition Diagram

Sem-3 Sujit Kumar

 UESC — CA (CC – 5)

Sem-3

2021-24

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(Compulsory)

1. Choose the correct answer of the following : 1×10 = 10

   (a) Among the following options, which of the following type of data structure is used in recursion ?

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   (ii) Array type of data structures

   (iii) List type of data structures

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(b) Which among the following matrix has lots of elements as zero ?

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(c) What maximum difference in heights between the leafs of a AVL tree is possible ?

(i) Log(n) where n is the number of nodes

(ii) n where n is the number of nodes

(iii) 0 or 1

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(d) What are the worst case and average case complexities of a binary search tree ?

(i) O(n), O(n)

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(iii) O(log n), O(n)

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(e) Which of the following is non-linear data structure ?

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(f) Maximum number of nodes in a binary tree with height k, where root is height 0, is :

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(iii) 2^{k-1+1} (iv) 2^{k-1}

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2. Convert the following infix expression to postfix using stack.

A+(B*C+D) / E 5

Group – B

3. Answer any **three** questions of the following : 15×3 = 45

(a) Write an algorithm for binary search and linear search.

(b) What is AVL tree ? Construct AVL tree for the following data and mention the type of rotation for each case.

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(c) Write an algorithm for insertion sort. Sort the following elements using insertion sort.

12 4 3 1 15 45 33 21 10 2

(d) What do you mean by stack and its applications ? Write an algorithm for PUSH and POP operation in stack.

(e) Explain the following terms :

(i) Threaded Binary Tree

(ii) Hash Table

(iii) Priority Queue

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UESC — Math

(GE – 3 / DSC – C)

2021-24

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(Compulsory)

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2. Prove that the series $1 + 4 + 7 + \ldots\ldots$ is divergent. 5

3. If H is any subgroup of a group G, then prove that $HH = H$. 5

Group – B

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(b) Test the convergence of the series whose general term is $\left(1-\frac{1}{n}\right)^{n^2}$ 10

5. (a) Prove that the series $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots.+\frac{1}{n^2}$ is convergent. 10

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UESE — Phy
(GE – 3)

2021-24

Time : 3 hours

Full Marks : 75

Pass Marks : 30

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Group – A

(Compulsary)

1. Answer **all** questions of the following : 1×10 = 10

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Answer any **four** questions of the following : 15×4 = 60

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Sujit Kumar

5. Deduce Maxwell-Boltzmann distribution law of velocities.

6. What is Black body radiation ? State and prove Stefan's Law.

7. Discuss Fermi Dirac distribution law and show that $n_i = \frac{g_i}{[e^{\alpha+\beta E_i}]+1}$.

8. Write short notes on any two of the following :
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   (c) Electron Gas
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❖

Sujit Kumar.

UESC — CA
(CC – 7)

2021-24

Time : 3 hours

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Answer from both the Groups as directed.

Group – A

1. Select the most appropriate option from the following : 1×10 = 10

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2. What is Computer network ? How computer networks are classified ? 5

Group – B

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UESC — CA
(CC – 6)

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Sem-3 Sujit Kumar

 UESC — CA (CC – 5)

Sem-3

2021-24

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