

Siliguri Institute of Technology
Department of Computer Science & Engineering
Internal Examination I
Operations Research(CS605A)
Maximum Marks: 30
Maximum Time: 60 mins

Group-A

1. Answer the following:[5 x 1 =5]

- i) What is the method to solve an LPP involving artificial variable ?
a) Simplex b) Charnes M method c) VAM d) none of these
- ii) If in the Simplex algorithm the basis column of the final Simplex table contains an artificial variable the problem has
a) Degenerate solution b) Infeasible solution
c) Unbounded solution d) Multiple solution
- iii) Given a system of m simultaneous equation in n unknown ($m < n$). The number of basic variable is
a) m b) n c) $m-n$
d) $m+n$
- iv) The system $x + y + z = 0$ has
a) Unique solution b) No solution c) infinitely many solutions d) none
- v) The Dual of dual problem is
a) Dual b) Primal c) Dual or Primal
d) none of these

Group-B

Answer any two.[2 x 5= 10]

2. Solve the following LPP by graphical method
Minimize $z = -x_1 + 2x_2$ Subject to $-x_1 + 3x_2 \leq 10$, $x_1 + x_2 \leq 6$, $x_1 - x_2 \leq 2$, $x_1, x_2 \geq 0$.
3. Solve the following Linear programming problem by simplex method:
Maximize $z = 3x_1 + 2x_2 + 3x_3$ Subject to $2x_1 + x_2 + x_3 \leq 2$, $x_1 + 2x_2 + 3x_3 \leq 5$, $2x_1 + 2x_2 + x_3 \leq 6$, $x_1, x_2, x_3 \geq 0$
4. Solve the following linear programming problem by the Two-Phase method
Minimize $z = x_1 + x_2$ Subject to $2x_1 + x_2 \geq 4$, $x_1 + 7x_2 \geq 7$, $x_1, x_2 \geq 0$

Group-C

Answer any one.[1 x15= 15]

5. Find the dual of the following LPP
Minimize $z = 2x_1 + 3x_2 + 3x_3$ Subject to $4x_1 + 3x_2 + x_3 = 6$, $x_1 + 2x_2 + 5x_3 = 4$, $x_1, x_2, x_3 \geq 0$
6. Find the dual of the following LPP
Minimize $z = 3x_1 + 2x_2 + x_3$ Subject to $2x_1 + 5x_2 + x_3 = 12$, $3x_1 + 4x_2 = 11$, x_1 is unrestricted in sign, $x_2, x_3 \geq 0$

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Siliguri Institute of Technology
Department of Electrical Engineering
B. Tech. 1st Year 1st Semester 1st Internal Examination, 2021
Paper Name & Code: Basic Electrical Engineering (ES EE 101)
Section: CSE A, CSE B, EE, ECE, IT

Time Allotted: 1 Hour

Full Marks: 30

SECTION A (CO 1)

[5 x 1 = 05]

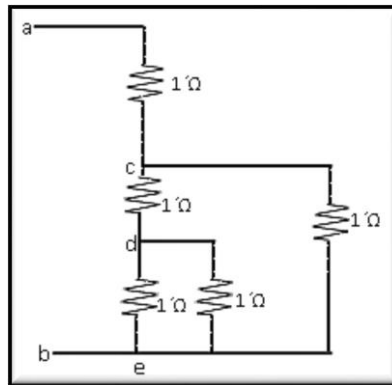
1. Answer all the questions:

- i. Two resistors are in series: a $5\ \Omega$ resistor and a $10\ \Omega$ resistor. The voltage drop across the $10\ \Omega$ resistor is 10V . The voltage across the $5\ \Omega$ resistor is
 (a) 5V (b) 0.5V (c) 1V (d) 10V
- ii. Five resistors are connected in a series and there is a current of 2A into the first resistor. The amount of current into the third resistor is
 (a) 2A (b) 0.4A (c) 10A (d) 0.5A
- iii. The total resistance of a parallel circuit having two parallel resistors is $1\text{k}\Omega$. One of the resistors is $2\ \text{k}\Omega$. The other resistor value is
 (a) 0 (b) $2\ \text{k}\Omega$ (c) $4\ \text{k}\Omega$ (d) $8\ \text{k}\Omega$
- iv. For an ideal voltage source its internal resistance is
 (a) zero (b) infinite (c) none of these
- v. Using source conversion if the voltage source having 5V , $2\ \Omega$ is converted to an equivalent current source then it will be
 (a) 5A , $2.5\ \Omega$ (b) 2.5A , $5\ \Omega$ (c) 5A , $2\ \Omega$ (d) 2.5A , $2\ \Omega$

SECTION B (CO 1) (Answer any two)

[2 x 5 = 10]

2. What do you mean by current? What is the relationship between charge and current?
3. Define electric power and energy. What is the relation between them?
4. Determine the resistance across 'ab' for the circuit shown in the figure.

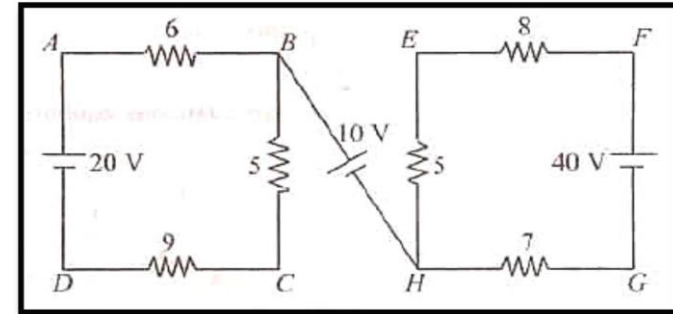


5. Two resistors $4\ \Omega$ and $6\ \Omega$ are in parallel; which resistor will dissipate maximum power? Explain.

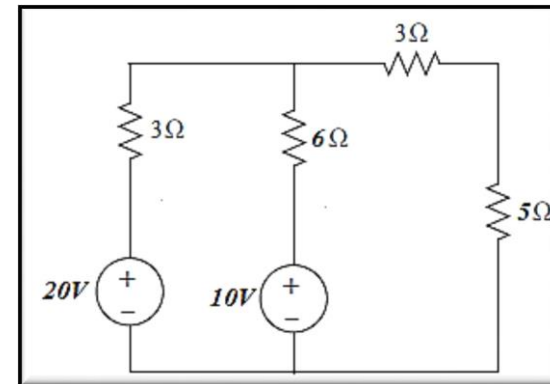
SECTION C (CO 1) (Answer any one)

[1 x 15 = 15]

6. a) Define Node, Branch, Loop & Mesh of a DC circuit with suitable diagram. [5]
 b) For the circuit shown in the figure, find V_{CE} and V_{AG} . [10]



7. a) State the Superposition theorem. What is its limitation? [3+2=5]
 b) Determine current through the $5\ \Omega$ resistor using Thevenin's theorem. [10]



2nd Internal Examination
Paper: Computer Networking
Paper Code: IT 602
IT-6th Sem
Total Marks: 50
Time: 1Hr 30 Mnts

Answer any **five** questions of Part-A & any **four** from Part-B

Part-A

5x2= 10

1. Which of the following is an interior routing protocol?
a) RIP b) OSPF c) BGP d) Both (a) and (b)
2. Sliding window protocol is a technique used for
a) Error Control b) Session Control c) Flow Control d) Concurrency Control
3. In the Layer, a data unit called Frame.
a) Physical b) Application c) Network d) Datalink
4. In all messages transferred in a unidirectional manner, all the time.
a) Token Bus b) Token Ring c) Fast Ethernet d) None of these
5. Connections to the thick Ethernet cable are generally made using
a) RJ45 b) BNC Connectors c) Vampire Tabs d) DNC Connectors
6. You have a class C 192.168.10.0/28 network. How many usable subnets & hosts do you have?
(a) 16 subnets, 16 hosts (b) 1 subnet, 256 hosts (c) 4 subnets, 64 hosts (d) 2 subnets, 128 hosts
7. In Mesh topology what will be the number of total links if 7 nodes are connected?

Part-B

4x10=40

1. What is Cryptography? Describe different types of Cryptography.
2. Describe OSPF Routing Protocol.
3. Differentiate between TCP & UDP.
4. Describe Ethernet Frame Format.
5. What is ARP? Describe different ARP operations.
6. Describe different serial data transmission mode.
7. Write short note on DNS.
8. Differentiate between Go back N ARQ and Selective Repeat ARQ.

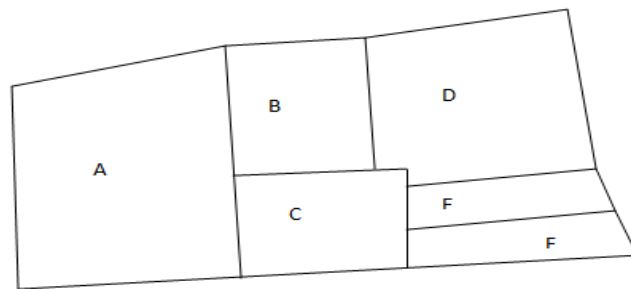
Siliguri Institute of Technology
Department of Information Technology
Second Internal Exam – 2019

Paper Name: Artificial Intelligence
Full Marks: 50

Paper Code: IT 605D
Time: 1 hour 30 minutes

Answer the following questions:

1. Consider the “**map coloring problems**” where a given map is to be colored in manner so that no neighboring states of a country contain the same color. Give a solution to following map coloring problem viewing it as a Constraint Satisfaction Problem. (10)



2. Consider the following 3-puzzle problem:

(5+5+5)

Start state

2	3
1	

Goal State

1	2
	3

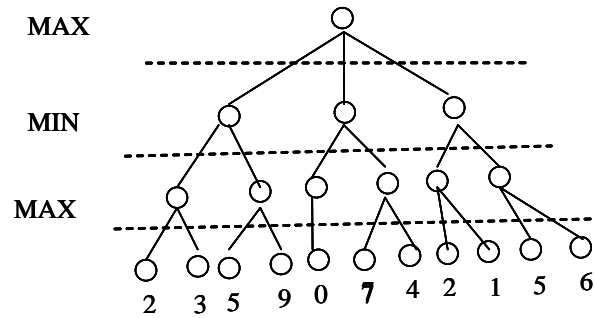
Possible operators (in order) are up, down, left and Right. Assume that repeated states are not detected. **Label each visited node with a number indicating the order in which they are visited.**

- a) Draw the search tree using BFS.
- b) Would DFS find the goal? Explain it.
- c) A* search with the heuristic being the sum of number of moves and the number of misplaced tiles.

3.

a) Consider the following game tree.

(5+10)



- i) Using MINIMAX procedure, determine what moves should be chosen by the maximizer in his first turn.
- ii) Execute Alpha-Beta pruning on the above game tree. How many terminal nodes are examined? For each cutoff specify whether it is an Alpha-cutoff or Beta-cutoff.

4.

a) Show that "It will rain", using resolution principle.

Given: "If it is hot then it is humid. If it is humid then it will rain. It is hot."

(5)

b) Convert the following sentences into first order predicate logic:

(1x5)

- i) Everyone loves Ram.
- ii) Not everyone loves Ravana.
- iii) Some people did not come for all meetings.
- iv) Not everyone came for all meetings.
- v) Only one person spoke at the meeting.

SILIGURI INSTITUTE OF TECHNOLOGY
DEPARTMENT OF BUSINESS ADMINISTRATION (MBA)
MBA (N) 1st SEM'19, 2nd INTERNAL TEST (Continuous Evaluation IV)

Paper Name: **QUANTITATIVE TECHNIQUES**
 Full Marks: **30**

Code: **MB 106**
 Time: **1 Hour**

GROUP A (Operations Research)

Q1. Answer all Questions (CO1)

(3 x 1 = 3)

(i) A transportation problem having $m \times n$ structure will result a non-degenerate solution if total number of independent allocations is

- (a) $m + n - 1$ (b) mn (c) $m - n + 1$ (d) $m + n + 1$

(ii) In Simplex method Variables are added in case of 'equality (=) type constraint'

- (a) Slack (b) Artificial (c) Surplus (d) None of these

(iii) Every LPP is associated with another LPP is called _____

- (a) Primal (b) Dual (c) Non linear (d) None of these

Q2. Answer any two from the following (CO3)

(3 x 2 = 6)

(a) Find the Optimal Assignment schedule of following machine & job allocation problem

	J1	J2	J3	J4	J5
M1	9	11	15	10	11
M2	12	9	--	10	9
M3	--	11	14	11	7
M4	14	8	12	7	8

(b) Find the Dual of the following LPP:

Maximize $Z = 4x_1 + x_2 + 7x_3$

Subject to Constraints: $x_1 + 7x_2 - 3x_3 \leq 4$;

$5x_1 - x_2 + x_3 \geq 12$;

$x_1 + x_2 + x_3 = 10$

Where all the $x_1, x_2, x_3 \geq 0$

(c) Apply the Principal of Dominance to solve the following game whose pay-offs are given below:-

æ47
C-11

Q3. Compulsory: Find the Initial Basic Feasible Solution by VAM of the following Transportation Problem. (CO3) (6)

	W1	W2	W3	W4	W4	Supply
F1	55	30	40	50	50	40
F2	35	30	100	45	60	20
F3	40	60	95	35	30	40
Demand	25	10	20	30	15	

GROUP B (Statistics)

Q4. Answer All (CO1)

(2 x 1 = 2)

(i). Consider a random experiment of throwing a die. What is the probability of getting odd face?

- (a) 1/6 (b) 2/3 (c) 1/2 (d) 0

(ii). Consider the random experiment of choosing a card. What is the probability of getting queen?

- (a) 1/52 (b) 1/13 (c) 2/13 (d) 1

Q5. Answer any two from the following (CO3)

(3 x 2 = 6)

(i) If X is normally distributed with mean 11 and standard deviation 1.5, then find the probability of $x = 1$

(ii) Consider the random experiment of tossing a fair coin till a head appears for the first time. Let X is the number of tosses required. Find the distribution of X.

(iii) A system that will either operate or fail in a certain event mission and let p denotes the probability of the successful operation. Eight trails are considered with the result S, F, S, S, S, F, S, S. Assuming independence of the trails find the maximum likelihood estimates of p.

Q6. Compulsory (CO3): The following table gives the ages and blood pressure of 10 women

(7)

Age(X)	56	42	36	47	49	42	60	72	63	55
Blood Pressure(Y)	147	125	118	128	145	140	155	160	149	150

Determine the (a) regression line of Y on X (b) regression line of X on Y (c) correlation coefficient between X and Y

And (d) Estimate the blood pressure of a women whose age is 45 years.

SILIGURI INSTITUTE OF TECHNOLOGY
DEPARTMENT OF BUSINESS ADMINISTRATION (MBA)
Even Semester; 2nd Internal Examination, May 2019
MBA (O) 4th SEMESTER'19 (COMPULSORY PAPER)

Paper Name: **Entrepreneurship Development & Project Management**
 Full Marks: **30**

Code: **MB 401**
 TIME: **1 Hour**

Group – A (MCQ: Answer any FIVE questions) CO1 (5 x 1 = 5)

1. (i) Microwave Oven is an example of innovation borne out of
 - (a) Demographic changes
 - (b) Perceptual changes
 - (c) Process needs
 - (d) Unexpected occurrences.
- (ii). Need for Affiliation is a need mentioned in
 - (a) Maslow's theory
 - (b) McClelland's 3 need theory
 - (c) Alderfer's ERG theory
 - (d) All of these
- (iii) Which of the following is not considered as 'Project Deliverables'?
 - (a) Time
 - (b) Cost
 - (c) Resource
 - (d) Performance
- (iv) The value of Schedule Performance Index of a Project more than one indicates that the Project is
 - (a) Ahead of schedule
 - (b) Behind schedule
 - (c) Indeterminable
 - (d) On schedule
- (v) For a Socially Desirable Project, its Benefit-Cost Ratio (B/C) is
 - (a) More than 1
 - (b) Less than 1
 - (c) Equal to 1
 - (d) Between 0 and 1
- (vi) Crash Time in Project Crashing indicates
 - (a) Expected time to complete an activity
 - (b) Shortest possible time to finish an activity
 - (c) Average value of all activity durations
 - (d) Standard Deviation of critical activity times

GROUP – B (Answer any TWO questions) CO2 (2 x 5 = 10)

7. Explain the main functions of an Entrepreneur. CO1
8. What are the differences between convergent & divergent thinking? CO1
9. Write a short note on the (a) Line of Balance (LOB) method of evaluating project performance OR the (b) Different Project performance indicators used in Earned Value Technique. CO2
10. State the objectives of Project Audit. Give major responsibilities of a Project Auditor. CO2
11. What do you mean by Social Desirability of a Project in relation to Social Cost Benefit Analysis? CO1
12. Construct the Project network for Real Estate construction at Madurai based on following data:-

Activity	A	B	C	D	E	F	G	H	I	J
Predecessor	-	A	A	A	A	B	C	D, F	E, G	H, I
Duration (Weeks)	12	7	11	8	6	10	9	14	13	16

Determine - Critical path, Expected Project Completion Time (CO3)

GROUP – C (Answer any ONE Question) CO3 (15 x 1 = 15)

11. What is Project Report? Discuss the various methods employed for Project Appraisal.
12. From the following information, calculate the Net Present Value of the two project and suggest which of the two projects should be accepted at a discount rate of 10% per annum.

	Project X	Project Y
Initial Investment	Rs. 20,000	Rs. 30,000
Estimated Life	5 years	5 years
Scrap Value	Rs. 1,000	Rs. 2,000

The profits before depreciation and after taxation (cash flows) in Rs are as follows:

	Year 1	Year 2	Year 3	Year 4	Year 5
Project X	5,000	10,000	10,000	3,000	2,000
Project Y	20,000	10,000	5,000	3,000	2,000

The following are the present value factors @ 10% p.a.

Year	1	2	3	4	5	6
Factor	0.909	0.826	0.751	0.683	0.621	0.564

Group-A:

1. Answer the following.[5 x 1 =5]

- I. There are _____ tuples in finite state machine.
 a) 4 b) 5 c) 6 d) unlimited
- II. According to Chomsky classification finite automata is of
 a) Type 0 b) Type 1 c) Type 2 d) Type 3
- III. Minimum number of states require to accept string ends with 10.
 a) 3 b) 2 c) 1 d)None of these
- IV. Transition function maps.
 a) $\Sigma^* Q \rightarrow \Sigma$ b) $Q^* Q \rightarrow \Sigma$ c) $\Sigma^* \Sigma \rightarrow Q$ d) $Q^* \Sigma \rightarrow Q$
- V. Which is a True statement:
 a) Every DFA is a NFA a) Every NFA is a DFA

Group-B

Answer any two. [2 x 5= 10]

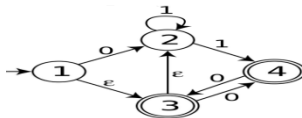
2. Construct a FA, where number of 0's and number of 1's divisible by 3 over alphabet set $\Sigma = \{0,1\}$.
3. Construct a FA, where every string end with 'ab' over alphabet set $\Sigma = \{a,b\}$.
4. Construct a FA, where every string contain three consecutive 1's over alphabet set $\Sigma = \{0,1\}$.

Group-C

Answer any one. [1 x15= 15]

5. a) Construct a DFA, for the following NFA.

7



- b) Write the Regular Expressions for the following. 4+4=8
- i. Containing even number of 0's
- ii. Set of all words with at least two b's over the alphabet set {a, b}.
6. a) Minimize the DFA given in the following table 8

Q/ Σ	0	1
$\rightarrow Q_0$	Q_1	Q_2
Q_1	Q_2	Q_3
Q_2	Q_2	Q_4
$*Q_3$	Q_3	Q_3
$*Q_4$	Q_4	Q_4
$*Q_5$	Q_5	Q_4

- b) Construct a FA, that accepts all strings over{0, 1} having even number of 1's and each 1 is followed by at least one 0.

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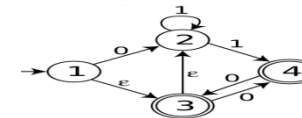
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Group-A:

1. Answer the following. [5 x 1 =5]

- I) Which of the following method used in Merge Sort algorithm:
 a)backtracking b)Divide-and-conquer c)Greedy Method d)Dynamic programming
- II) Time complexity of Quick Sort in worst case is
 a) O(n) b) O(n log n) c) O(n²) d) O(log n)
- III) Time complexity of binary search algorithm:
 a) O(n) b) O(n log n) c) O(n²) d) O(log n)
- IV) O -Notation provides an asymptotic
 a) upper bound b) lower bound c) tight bound d) none of these
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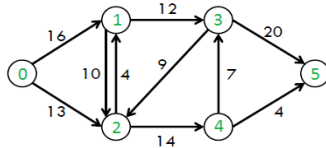
Answer any two. [2 x 5= 10]

2. Solve the following recurrence using **Master Theorem**.
 $T(n) = 2T\left(\frac{n}{2}\right) + O(n)$
3. What is the recurrence relation of **Binary search** and derive the **time complexity** of **Binary search**.
4. Derive the Time complexity of **Merge sort algorithm**.

Group-C

Answer any one. [1 x15= 15]

5. a) Find the shortest path between vertex '0' to vertex '5' using Dijkstra's Algorithm for the following graph.



[8+7]

- b) Create a **Max Heap** for the following key elements. A = {25, 20, 45, 58, 70, 86}

6. a) Find an **optimal parenthesization** of a **matrix-chain product** whose sequence of dimensions is(10,20,50,1,100).

- b) Perform the **partition** operation once (one time) on the following array as per the requirement of the **quicksort algorithm**, assuming the last element is the pivot of the array. Clearly mention the steps. A[] = {7,8,2,1,6,5,4,3,9}

[8+7]

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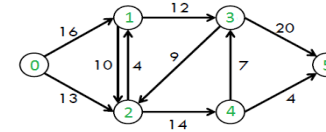
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[8+7]

Siliguri Institute of Technology
Department of Engineering Sciences & Humanities
1st SLOT TEST EXAMINATION, ODD SEM 2021
SUBJECT: Chemistry (BS-CH 101)



B-Tech: 1st Year (EE & ECE)

SEMESTER: 1st

MARKS: 30

TIME: 1HR.

QI. MCQ

[CO4]

1. Choose the Correct Answer (Any Five): (5 x 1 = 5)

- (a) The number of spherical nodes in 3p orbitals is (i) 0, (ii) 1, (c) 2, (d) 3.
- (b) Which of the following pairs have identical bond order (i) N_2^+ and O_2^+ (ii) C_2 and N_2 , (iii) F_2 and Ne_2 , (iv) O_2 and B_2 .
- (c) Uncertainty in the position of an electron moving with a velocity 300 ms^{-1} , accurate up to 0.001% will be (i) $1.92 \times 10^{-2} \text{ m}$, $3.84 \times 10^{-2} \text{ m}$, $5.76 \times 10^{-2} \text{ m}$, $19.2 \times 10^{-2} \text{ m}$.
- (d) For an electron in a Hydrogen atom, the wave function Ψ is proportional to $e^{-\frac{r}{a_0}}$, where a_0 is the Bohr radius. What is the ratio of the probability of finding it at a_0 ? (i) e , (ii) e^2 , (iii) $\frac{1}{e^2}$ (iv) Zero.
- (e) The CFSE for d^7 metal in an octahedral field is given by (i) $-0.4\Delta_0$, (ii) $-0.6\Delta_0$, (iii) $-0.8\Delta_0$, (iv) $-1.2\Delta_0$.
- (f) For a particle in a three dimensional box, the degeneracy for (111) system is (a) 0, (ii) 3, (iv) 4, (d) 6.
- (g) The de Broglie wavelength associated with a cricket ball of 200 gm with a speed of $3 \times 10^3 \text{ cm/sec}$ is (i) $0.55 \times 10^{-32} \text{ cm}$, (ii) $1.1 \times 10^{-32} \text{ cm}$, (iii) $2.2 \times 10^{-32} \text{ cm}$, (iv) $11.0 \times 10^{-32} \text{ cm}$.
- (h) n-type semiconductor is formed due to doping of Si with (i) Phosphorous, (ii) Sodium, (iii) Boron, (iv) Oxygen.

QII. Short Questions

[CO4]

Answer (Any Two) Questions: (2 x 5=10)

2. (i) Deduce expression for kinetic energy of a particle in 1-dimensional box and the normalized wave function. (ii) Explain the bond order of N_2 and CO molecule with the help of MO energy level diagram. (ii) Write Schrodinger equation. What do various symbols signify?
3. (i) Which of the following molecules are aromatic in nature and why? (i) Furan, (ii) Cylo-propenyl anion and (iii) Cyclo-heptatrienyl cation. (ii) Sketch the d-orbital energy levels and the distribution of d electrons among them, state the geometry, list the number of d-electrons, list the

number of lone electrons and label whether they are paramagnetic or diamagnetic: (a) $[\text{Ti}(\text{H}_2\text{O})_6]^{2+}$ and (b) $[\text{CoF}_6]^{3-}$.

4. (i) Calculate CFSE for the Complex $[\text{Mn}(\text{H}_2\text{O})_6]$ in both strong and weak field. Given $\Delta_0 = 21,000 \text{ cm}^{-1}$ and the pairing energy is $28,800 \text{ cm}^{-1}$. (ii) Find the value of magnetic moment in the following complex ion $[\text{CoF}_6]^{3-}$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$.
5. (i) Discuss in brief 'Band Theory' in metals. What are Semiconductors? Distinguish between p-type Semiconductor and n-type Semiconductor. (ii) Discuss in brief crystal field theory. How will you account the splitting of t_{2g} and e_g for d^4 and d^7 system.

Q3. Long Questions

[CO3]

Answer (Any One) Questions: (1x 15=15)

6. (i) What is Beer Lambert law? Show that absorption is linearly proportional to the concentration of solution. On passing monochromatic light through a 0.05 (M) solution in a cell of 2 cm thickness, the intensity of transmitted light was reducing to 40%. Calculate the molar extinction coefficient. (ii) What do you mean by molecular spectroscopy? List the different types of molecular spectroscopy? Define Chromophores and Auxochrome with examples.
7. (i) Classify the electromagnetic spectrum with respect to lower to higher frequency. In what region of electromagnetic spectrum do Rotational, Vibrational and Electronic spectra lie? (ii) What is IR spectroscopy? How many types of molecular vibrations are associated with IR spectroscopy? Explain the different type's electronic transitions possible in UV-Visible spectra.

Siliguri Institute of Technology

Department of Engineering Sciences and Humanities

1st SLOT TEST EXAMINATION, ODD SEM 2020-21

SUBJECT: Mathematics IB (BS-M102)



B-Tech: CE, ECE & EE

SEMESTER: 1st

MARKS: 30

TIME: 1HR.

1. Choose the correct alternatives from the following: 5x1=5
- i. The value of $\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x} dx$ is [BSM 101 CO2]
- a. $\pi/2$ b. $\pi/\sqrt{2}$ c. 0 d. None of these
- ii. The value of the integral $\int_{-2}^2 x^2 \sin(x) dx$ is [BS-M 101 CO2]
- a. 0
b. -1
c. 1
d. None of these
- iii. In a non-zero matrix of order 2×5 , the rank can never be [BS-M 101 CO3]
- a. 2 b. 3 c. 1 d. None of a, b, c
- iv. The determinant of a skew symmetric matrix of order 5 is given by [BS-M 101 CO3]
- a. 5 b. 0 c. greater than 5 d. None of a, b, c
- v. If a matrix of order n is diagonalisable then [BS-M 101 CO3]
- a. There are n linearly independent eigen vectors corresponding to eigen values
b. The matrix is similar to a diagonal matrix
c. Only option a is correct
d. Both the options a and b are correct
2. Answer any **two** of the following: 5x2=10
- i. The circle $x^2 + y^2 = 25$ revolves about the x axis. Find the surface area of the sphere generated. [BS-M 101 CO2]

ii. Prove that $\int_0^1 \frac{\log(1+x)}{1+x^2} dx = \frac{\pi}{8} \log 2$. [BS-M 101 CO2]

iii. Find the volume of the paraboloid generated by revolving part of parabola $x^2 = 4y$ between the ordinates $y = 0$ and $y = 1$ about its axis. [BS-M 101 CO2]

3. Answer any **one** of the following:

15×1=15

i. (a) Diagonalise the matrix

$$\begin{bmatrix} 2 & -2 & 0 \\ -2 & 1 & -2 \\ 0 & -2 & 0 \end{bmatrix}$$

[BS-M101 – C03]

(b) Find the eigen values and eigen vector of the following matrix

$$\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$$

[BS-M 101 CO3]

ii. (a) Given the system of equation

[BS-M 101 CO3]

$$x + 4y + 2z = 1$$

$$2x + 7y + 5z = 2k$$

$$4x + my + 10z = 2k + 1$$

For what value of k and m the system has (i) unique solution (ii) no solution (iii) many solution. Solve the system in every cases.

(b) Solve if possible

[BS-M 101 CO3]

$$x + y + z = 1$$

$$2x + y + 2z = 2$$

$$3x + 2y + 3z = 5$$

Department: DESH

Paper Code: BS-M 101

Question vs. CO mapping:

Course Outcome	Question Number	Marks allotted
CO2	Q. 1. (i), (ii)	1, 1(Total Marks 2)
	Q. 2 (i) (ii) (iii)	5,5,5(Total Marks 10)
CO3	Q. 1. (iii), (iv), (v)	1, 1,1(Total Marks 3)
	Q. 3 (i), (ii)	15, 15(Total Marks 15)

SILIGURI INSTITUTE OF TECHNOLOGY

1st INTERNAL EXAMINATION, ODD SEM 2020

PAPER NAME: PHYSICS I

PAPER CODE: BS-PH 101

B-Tech: CSE, IT, CE

SEMESTER: 1st FULL MARKS: 30

TIME: 1HR

CO1

Answer any **five** questions

[5x1=5]

1. Choose the correct alternatives of the following:

(i) Vector \vec{A} is solenoidal if

(a) $\vec{\nabla} \times \vec{A} = 0$ (b) $\vec{\nabla} \cdot \vec{A} = 0$ (c) $\vec{A} = 0$ (d) none

(ii) When a particle executes simple harmonic motion it has

(a) Maximum velocity at the mean position (b) Uniform velocity
(c) Minimum velocity at its mean position (d) None of these

(iii) Inside a positive crystal the refractive indices for E-ray and O-ray will be

(a) $\mu_e > \mu_o$ (b) $\mu_e < \mu_o$ (c) $\mu_e = \mu_o$ (d) $\mu_e = \mu_o = 0$

(iv) Maximum number of orders available with a grating is

(a) Independent of grating element (b) inversely proportional to grating element
(c) directly proportional to wavelength (d) directly proportional to the grating element

(v) The meta stable state has a mean lifetime of more than a) 10^{-8} sec b) 10^{-5} sec c) 10^{-3} sec d) 10^{-2} sec

(vi) The resolving power of a grating having N number of total rulings in the nth order is

(a) nN (b) n/N (c) n+N (d) none of these

(vii) In a single slit diffraction pattern the ratio of intensity of the first secondary maximum

to the central maximum is a) $\frac{I_1}{I_0} = \frac{1}{28}$ b) $\frac{I_1}{I_0} = \frac{1}{22}$ c) $\frac{I_1}{I_0} = \frac{1}{121}$ d) $\frac{I_1}{I_0} = \frac{1}{5}$

(viii) The moment of inertia of a body is always minimum with respect to its (a) Base (b) Centroidal axis (c) Vertical axis (d) Horizontal axis

(ix) For higher sharpness of the resonance curve the Q value must be (i) small (ii) large
(iii) medium (iv) None of these.

CO2

2. Answer any **two** of the following: [5×2=10]

(i) (a) State Brewster's law of polarisation. (b) What is the relation between the angle of polarisation and angle of refraction in a medium? (c) What are Polaroids? (d) Explain with a diagram the working of a Nicol Prism. [1+ 1 +1 + 2 = 5]

(ii) (a) Establish the differential equation for damped harmonic oscillator. (b) What is the condition for critically damped oscillation? (c) What is relaxation time (τ)? [3 +1 + 1 =5]

(iii) (a) Distinguish between Fresnel and Fraunhofer diffraction of light. (b) Write down the expression of the intensity of light for double diffraction. (c) What are missing orders? [2+1+2 = 5]

(iv) (a) Write down the relation between Einstein's A and B coefficients. (b) What is the physical significance of these coefficients? (c) Briefly discuss about double refraction. [1 + 2 + 2]

(v) (a) Explain graphically under-damped, over-damped and critically damped vibration. (b) What is relaxation time and quality factor? (c) Explain the physical significance of gradient, divergence and curl. [1+1+3]

CO3

3. Answer any **one** of the following: [15 x 1 = 15]

(i) (a) What is the minimum number of lines of a grating which resolve the 3rd order spectrum of two lines having wavelengths of 5890 Å and 5896 Å. [3]

(b) Calculate the thickness of half wave plate when the light of wavelength 589 nm for which the refractive indices of E-ray and O-rays are 1.544 and 1.553 respectively. [3]

(c) Light of wavelength 5000 Å is incident normally on a slit. The first minima of the diffracting pattern is observed to lie at a distance 5 mm from the central maxima on a screen which is placed at a distance 2 m from the slit. Calculate the width of the slit. [3]

(d) In a He-Ne laser transition from E_3 to E_2 level gives a laser emission of wavelength 632.8 nm. If the energy of the E_2 level is 15.2×10^{-19} J, how much pumping energy is required, if there is no energy loss in the He-Ne laser? [3]

(e) Two polarizers are crossed to each other. Third polarizer is placed between them which makes angle of θ with the first polarizer. An unpolarized light of intensity i_0 is incident of the first one and passes through all of the three polarizer. Calculate the intensity of the light emerging from the second polarizer. [3]

or

(ii) (a) Show that $\vec{A} = (6xy+z^3)\hat{i} + (3x^2-z)\hat{j} + (3xz^2-y)\hat{k}$ is irrotational. [3]

(b) Find if work done in moving an object in the field $\vec{F} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3xz^2\hat{k}$ from point (1,-2,1) to (3, 1, 4) is independent of the path chosen. [3]

(c) If $\phi(x,y,z)=3x^2y - y^3z^2$ find $\vec{\nabla}\phi$ at the point (1,-2,-1). [3]

(d) The motion of a particle of mass 0.1 kg, subjected to a restoring force constant 0.1 N/m, is critically damped. While at rest, its motion is started by an initial velocity of 0.5 m/sec. Find the maximum displacement of the particle. [3]

(e) At an instant of time, displacement of a particle is 12 cm, velocity is 5 cm/s and when its displacement is 5 cm, velocity is 12 cm/s. Calculate the amplitude, frequency and time period. [3]

