**IN-SEMESTER EXAMINATION-I**

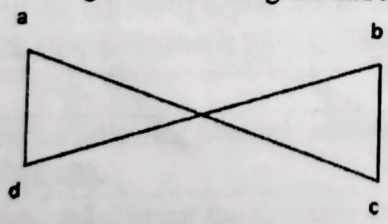
**S.E./S.T. (Semester-III)**

**SUBJECT – Mathematics-III**

**Branch: COMP, IT, CSE**
**Div.: ALL**
**Duration: 60 Minutes**
**Instructions –**

**Date: 26/08/2024**
**Timing: 02:00 PM to 03:00 PM**
**Maximum Marks: 20**

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Diagrams / sketches should be given wherever necessary.
4. Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5. Figures to the right indicate full marks.

| Q.1 | | Answer any 5 of the following questions | Marks | Course Outcomes | Learning Levels |
|---|---|---|---|---|---|
| | a. | Show that 7 colours are used to paint 50 bicycles then there are 8 bicycles of same colour. | 2 | 1 | U |
| | b. | Define i) Sets (with example)<br>ii) Difference of sets | 2 | 1 | R |
| | c. | Prove that among 5000 people there are 4 who are born at the same minute. | 2 | 1 | U |
| | d. | Prove that : $(A \times B) \cap (A \times C) = A \times (B \cap C)$ | 2 | 2 | R |
| | e. | Let A{1,2,3,4} and let R be the relation 'greater than' . represent R as a set of a digraph , a matrix and diagram. | 2 | 2 | U |
| | f. | For the given Hasse Diagram find maximum and minimum elements.<br> | 2 | 3 | R |
| | g. | Show that the "greater than or equal to" relation ($\geq$) is a partial ordering relation on the set of integers. | 2 | 3 | R |
| Q.2 | a. | Show that a relation is reflexive and circular iff it is an equivalence relation. | 5 | 2 | R |
| | | OR | | | |
| | b. | Let R and S be the relation on A then prove that<br>(a) If R is Symmetric prove that $R^{-1}$ & $\bar{R}$ are Symmetric.<br>Prove that $R \cup S$ & $R \cap S$ are Symmetric if R & S are Symmetric | 5 | 2 | U |

THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY

**IN-SEMESTER EXAMINATION-II**

**S.E./S.T. (Semester-III)**

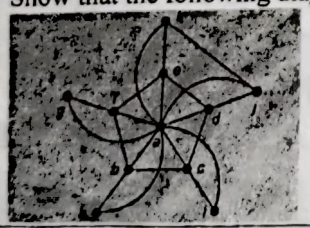
**SUBJECT – MATHEMATICS-III**

**Branch: COMP, IT, CSE**
**Div.: ALL**
**Duration: 60 Minutes**

**Date: 17/10/2024**
**Timing: 02:00 PM to 03:00 PM**
**Maximum Marks: 20**

**Instructions –**

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Diagrams / sketches should be given wherever necessary.
4. Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5. Figures to the right indicate full marks.

| Q.1 | | Answer any 5 of the following questions | Marks | Course Outcomes | Learning Levels |
|---|---|---|---|---|---|
| | a. | Define Directed Graph and Directed Multigraph with one Example. | 2 | 4 | R |
| | b. | Define Planar Graph giving illustations. | 2 | 4 | U |
| | c. | Translate the converse of the following statement: "If the sum of measures of angles in a figure is 180, then the figure is a triangle." | 2 | 5 | U |
| | d. | Explain , If $(p \wedge \sim r) \Longrightarrow (q \vee r)$ is false. Here, q and r both are false then p is _____ (True / False). | 2 | 5 | U |
| | e. | Define Group with examples | 2 | 6 | R |
| | f. | Define Cyclic group with suitable examples. | 2 | 6 | R |
| | g. | Find the weights of each of the following words in $B^5$ (i) X=00100 (ii) X=01010 | 2 | 6 | U |
| Q.2 | a. | Show that the following diagram has no Hamiltonian cycle.  | 5 | 4 | R |
| | | **OR** | | | |
| | b. | Show that an Undirected Graph has an even number of vertices of odd degree. | 5 | 4 | A |
| Q.3 | a. | Construct the Converse, inverse and contrapositive of the following: (i) It is cold then he wears a hats (ii) If an integer is multiple of 2 then it is even number. | 5 | 5 | A |
| | | **OR** | | | |
| | b. | Show that by using mathematical induction to prove that $2n < n!$ , for every integer $n \geq 4$. | 5 | 5 | U |

# END SEMESTER EXAMINATION, DEC 2024
## S.E. SEMESTER III (CBCGS-HME 2023)

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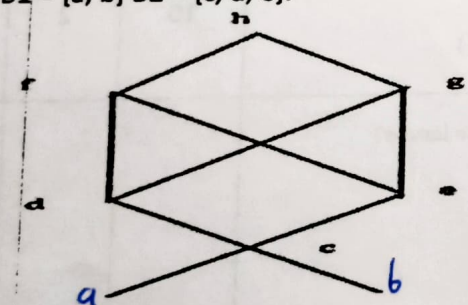
|---|---|---|---|
| **Branch:** | **COMP, IT, CSE** | **Q.P. Code:** | **ED243C5614RS2-2** |
| **Subject:** | **Mathematics-III** | **Duration:** | **2 hours** |
| **Subject Code:** | **BSC-COMP-IT-CSE 301** | **Max. Marks:** | **60** |

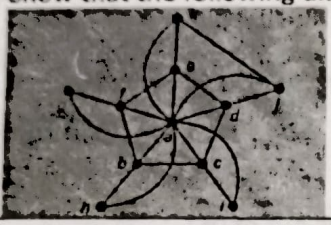
**Instructions:**
1. **All sections are compulsory**
2. **Figures to the right indicate full marks.**
3. **Assume suitable data if necessary and state the assumptions clearly.**

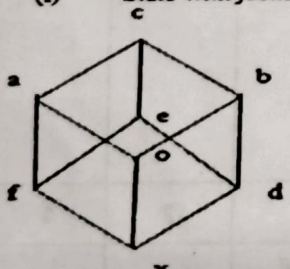
**Section-I** **Short Answer Questions (Answer any 05 questions out of 06)** **(10 Marks )**
**(Fundamental, Core Types)**

| Q. No. | | Marks | CO | RBT Level | PI |
|---|---|---|---|---|---|
| 1 | Let $A = \{a, b\}$.<br>Find $\mathcal{P}(\mathcal{P}(A))$ where $\mathcal{P}(A)$ denotes the power set of $A$. | 2 | 1 | R | 1.1.1 |
| 2 | Give an example of a function which is one to one but not onto. | 2 | 2 | U | 1.3.1 |
| 3 | Consider the POSET A={a,b ,c ,d ,e ,f ,g ,h}, whose Hasse diagram is shown in the figure below.<br>Deduce all upper bounds and lower bounds of following subsets:<br>B1 = {a, b} B2 = {c, d, e}.<br> | 2 | 3 | A | 2.1.3 |
| 4 | Define Planar Graph giving illustations. | 2 | 4 | U | 1.3.1 |
| 5 | Show how to Write down the symbolic form of the following statements:<br>"The number of columns in the 1^st matrix equals to the number of rows in the 2^nd matrix is the necessary condition for matrix multiplication." | 2 | 5 | U | 1.3.1 |
| 6 | Define Group with examples | 2 | 6 | R | 1.1.1 |

**Section-II** **Descriptive Answer Questions(Answer any 04 out of 06 )** **(20 Marks )**
**(Descriptive, Comprehension Types)**

| | | | | | |
|---|---|---|---|---|---|
| 1 | Prove that : If A is a finite set having n elements then power set of A consists $2^n$ elements. | 5 | 1 | R | 1.1.1 |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Let A={1,2,3,4} and B={x,y,z}.Let R={(1,x), (1,z), (2,y), (2,z), (3,x), (4,y)} and S={(1,y), (2,x), (2,y), (3,x)} Find (i) $M_R$ and $M_S$ (ii) $M_R'$ and $M_S'$ (iii) $M_R^{-1}$ and $M_S^{-1}$. | 5 | 2 | R | 1.3.1 |
| 3 | **Sketch the Hasse Diagram of $(D_{36}, |)$, where $D_{36} = \{x \mid 1 \le x \le 36$ *and* $x$ *divides* $36\}$.** | 5 | 3 | A | 2.1.3 |
| 4 | Show that the following diagram has no Hamiltonian cycle.  | 5 | 4 | R | 1.1.1 |
| 5 | Show that $1 + 2^n < 3^n$ *for* $n \ge 2$. | 5 | 5 | R | 1.1.1 |
| 6 | How to find if the (3,4) parity check code for m=3. $e(b) = x$ $e(000) = 0000$ $e(001) = 0011$ $e(010) = 0101$ $e(011) = 0110$ $e(100) = 1001$ $e(101) = 1010$ $e(110) = 1100$ $e(111) = 1111$ Discuss that Can you detect an error if b = 001 and e(b) = 0111? | 5 | 6 | A | 1.1.1 |

| **Section-III** | **Long Answer Question (Answer any 03 out of 05) (Application, Analytical, Evaluation, Design Type)** | **(30 Marks)** | | | |
|---|---|---|---|---|---|
| 1 | The Functions $f: R \to R$ & $g: R \to R$ are defined as $f(x) = x + 1$, $g(x) = x^2$ (ii) $(f \circ g)(-2)$ (iii) $f^{-1}$ $g(x) = x^2$. Find (i) $(g \circ f)(-2)$ | 10 | 2 | R | 1.3.1 |
| 2 | (i) State with justification is following figure lattice?   (ii) Show that in a distributive lattice $(A, \le)$ if $a \wedge x = a \wedge y$ and if $a \vee x = a \vee y$ then $x = y$. | 10 | 3 | A | 2.1.3 |
| 3 | (i) Is every Hamiltonian graph Eulerian? Give an example. (ii) Is every Eulerian graph Hamiltonian? Give an example. | 10 | 4 | A | 2.1.3 |
| 4 | Define Principle of Mathematical Induction and prove that $2^{2n} - 1$ is divisible by 3, for all integers $n \ge 0$. | 10 | 5 | U | 1.3.1 |

| | | | | | |
|---|---|---|---|---|---|
| 5 | With an (2,5) group encoding function $e : B^2 \rightarrow B^5$ defined by E(00)=00000, E(01)=01110, E(10)=10101, E(11)=11011,<br>Decode the following words relative to maximum likelihood function<br>(i) 11110, (ii) 10011 | 10 | 6 | A | 2.1.3 |