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| **Scheme of Valuation/Answer Key**  (Scheme of evaluation (marks in brackets) and answers of problems/key) | | | | | |
| **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  FIFTH SEMESTER B.TECH (S) DEGREE EXAMINATION, MAY2019 | | | | | |
| **Course Code: CS309** | | | | | |
| **Course Name: GRAPH THEORY AND COMBINATORICS** | | | | | |
| Max. Marks: 100 | | |  | Duration: 3 Hours | |
| **PART A** | | | | | |
|  |  | Answer all questions, each carries3 marks. | | | Marks |
| 1 |  | Walk- 1mark, Trail- 1mark, Path- ½ mark, Cycle- ½ mark | | | 3 |
| 2 |  | Definition of pendant vertex- ½ mark example- ½ mark, isolated vertex -½ mark example-½ mark and null graph -½ mark example- ½ mark. | | | 3 |
| 3 |  | travelling salesman problem definition- 1 mark.  Print a travelling salesman’s tour – 2 marks | | | 3 |
| 4 |  | Proof- 3 marks | | | 3 |
|  |  |  | | |  |
| **PART B** | | | | | |
| ***Answer any two full questions, each carries9 marks.*** | | | | | |
| 5 | a) | Definition-1 mark, Finding mapping- 3 marks | | | 4 |
|  | b) | Subgraph definition- 1 mark. Examples – 1 mark each | | | 2 |
|  | c) | i) n(n-1)/2 = 55 edges -1.5marks  ii) (n-1)/2= 5 edge-disjoint Hamiltonian circuits – 1.5 marks | | | 3 |
| 6 | a) | Graph- 3 marks | | | 3 |
|  | b) | Any 2 applications | | | 2 |
|  | c) | Finding eulerian circuit- 2 marks  Proper justification- 2 mark | | | 4 |
| 7 | a) | Proof- 3 marks | | | 3 |
|  | b) | Give Hamiltonian circuit – 3 marks | | | 3 |
|  | c) | Prove the cases when a circuit is obtained and a set of circuits is obtained. | | | 3 |
| **PART C** | | | | | |
| ***Answer all questions, each carries3 marks.*** | | | | | |
| 8 |  | Proof- 3 marks | | | 3 |
| 9 |  | Steps- 3 marks | | | 3 |
| 10 |  | Listing all cut sets- 3 marks | | | 3 |
| 11 |  | Proof- 3 marks | | | 3 |
|  |  |  | | |  |
| **PART D** | | | | | |
| ***Answer any two full questions, each carries9 marks.*** | | | | | |
| 12 | a) | Definition- 1mark, properties of trees- 2 marks | | | 3 |
|  | b) | Proof – 3marks | | | 3 |
|  | c) | Proof – 3marks | | | 3 |
| 13 | a) | Proof – 3marks | | | 3 |
|  | b) | Note on geometric dual with example- 3 marks  combinatorial dual with example- 3 marks. | | | 6 |
| 14 | a) | Construct T1 and T2- 1mark  Branch set, chord set- 2 marks  Rank and nullity-1 mark | | | 4 |
|  | b) | Satisfying edge connectivity- 2 marks  Satisfying vertex connectivity- 2 marks  Satisfying degree- 1 marks | | | 5 |
| **PART E** | | | | | |
| ***Answer any four full questions, each carries10 marks.*** | | | | | |
| 15 | a) | incidence matrix – 3 marks | | | 3 |
|  | b) | Proof- 2 marks | | | 2 |
|  | c) | Dijkstra’s algorithm – 2 marks  find shortest path between (A, G) – 3 marks. | | | 5 |
| 16 | a) | Proof- 3 marks | | | 3 |
|  | b) | fundamental circuit matrix from a circuit matrix – mark  Derive rank of fundamental circuit matrix – 1 mark | | | 2 |
|  | c) | Explanation- 2.5+2.5 marks | | | 5 |
| 17 | a) | Proof- 3 marks | | | 3 |
|  | b) | path matrix definition- 1 mark, disadvantage of path matrix – 1 mark | | | 2 |
|  | c) | Minimum spanning tree of the graph- 3 marks, Rank and nullity-2 | | | 5 |
| 18 | a) | Proof- 5 marks | | | 5 |
|  | b) | Kruskal’s algorithm – 2 marks, minimum cost spanning tree- 3 marks | | | 5 |
| 19 | a) | Cut sets- 2 marks  cut set matrix- 2 marks , rank- 1 mark. | | | 5 |
|  | b) | algorithm to check whether a graph is connected or not- 3 marks  implementation with an adjacency matrix- 2 marks | | | 5 |
| 20 | a) | Any five properties of circuit matrix- 5 marks. | | | 5 |
|  | b) | Explain- 2.5+2.5 | | | 5 |
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