No. of Printed Pages : 4

MCS–033

MASTER OF COMPUTER APPLICATION (REVISED) (MCA)

Term-End Examination

June, 2025

MCS–033 : ADVANCED DISCRETE MATHEMATICS

Time : 2 Hours *Maximum Marks : 50*

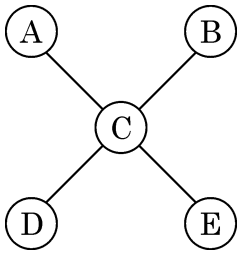
***Note** : Question No. **1** is compulsory. Attempt any **three** questions from the rest.*

1. Attempt any *four* of the following :

   (a) Write and explain Dirac's criterion and Ore's criterion for Hamiltonian graph. 5

   (b) Show that, if G is a connected planar (p, q) graph, then the number r of the regions of G is given by $r = q - p + 2$. 5

(c) Differentiate between Eulerian graph and Eulerian Circuit. Check whether the graph is a Euler circuit : 5



(d) Verify that $a_n = \frac{3}{2}n - 2$ is a solution to the recurrence relation $a_n = 2a_{n/2} + 2$, where n is a power of 2 and $a_2 = 1$. 5

(e) Use power series method to find the number of selections of fruits, if we have ₹ 50 with us and it is given that an apple costs ₹ 5, a banana costs ₹ 2 and a coconut costs ₹ 3. 5

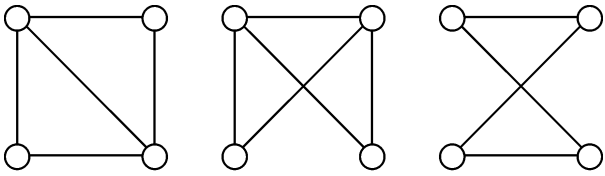
2. (a) Write and explain Handshaking theorem with suitable example. Also verify that the sum of the degrees of all the vertices of any graph is even. 5

(b) Compare the following : 5

(i) Graph and Subgraph

(ii) Tree and Spanning tree

3. (a) Explain the term 'Isomorphism'. Which of the following graph is/are isomorphic ? 5



G_1 G_2 G_3

(b) Find the chromatic number of the following : 5

(i) Bipartite graph with a non-empty edge set

(ii) An odd cycle $C_{2n+1}, n \geq 1$

4. (a) Solve the recurrence relation : 5

$$F_n = 5F_{n-1} - 6F_{n-2}$$

$$F_o = 1 \text{ and } F_1 = 4$$

(b) Find the generating function associated with the sequence Fibonacci sequence $\{a_x\}$, where $k \geq 1$, then deduce the formula for $a_k, k \geq 1$. 5

5. Write short notes any *two* of the following : 5+5

(i) Vertex colouring

(ii) Edge colouring

(iii) Map colouring

× × × × ×