M.Sc., Mathematics, Internal Assessment

Fourth Semester (2018-19 Batch)

Instructions:

1. Answer all the questions from each of the following courses. Each questions carry 5 marks.
2. Write assignment of each course separately using A4 sheets (one side).
3. The assignment of each course must be enclosed with covering sheet.
4. The assignment should be submitted to the department address.
   The Lecturer, Department of Studies in Mathematics, Vijnan Bhavan, Karnataka State Open University, Mysuru-570006.
5. The assignment must be submitted on or before **10th of April 2021**.

Course: Math 4.1: Number Theory

1. Sate and prove the fundamental theorem of arithmetic.
2. State and prove Chinese remainder theorem.
3. Show that for each positive integer $n \geq 1, n = \sum_{\frac{d}{n}} \phi(d)$, the sum being extended over all positive divisors of n.
4. If p and q are distinct odd primes, then show that $\left(\frac{p}{q}\right)\left(\frac{q}{p}\right) = (-1)^{\left(\frac{p-1}{2}\right)\left(\frac{q-1}{2}\right)}$

Course: Math 4.2: Graph Theory and Algorithms

1. Prove that the sum of the degree of the vertices of a graph G is twice the number of edges. Further prove that every cubic graph has even number of vertices.
2. Define complement of a graph. Prove that any self- complementary graphs has $4n$ or $4n + 1$ points.
3. Define a bipartite graph. Show that a graph is bipartite if and only if all its cycles are even.
4. Explain Breadth First Search algorithm with an example.

Course: Math 4.3: Fluid Mechanics

1. Derive the relation between stress and rate of strain component.
2. Explain Stoke's law of friction.
3. Derive the equation of energy for an incompressible viscous fluid in usual form.
4. State and prove Buckingham $\pi -$ theorem.

Course: Math 4.4: Mathematical Statistics

1. Define a field. Prove that intersection of a finite number of fields defined over a space Ω is also a field.
2. State and prove Baye's theorem.
3. Write the probability distribution function of Binomial distribution and show that mean $E(X) = np$ and variance $\sigma^2 = npq$.
4. State and prove Neyman factorization theorem.