Max. Marks 120

Important Instructions:
1.   *Attempt Part A and Part B on separate answer books.*
2.   *"Optimization concepts and applications in Engg" by Belgandu & Chandrupatla, "Materials Selection in Mechanical Design" by M.F.Ashby and Machine Design by Norton are permitted for reference for Part B ONLY. Answer book for Part B would be provided to a candidate only after receiving Part A answer books from him.*

Part A

1. [i] Describe briefly with the help of a flow chart the process of achieving Optimum Design of a machine tool. [ii] Explain the meaning of Optimization, Objective function, Constraint[s], Feasible solution space and design/ solution variables with the help of this mechanical system as an example. [iii] Also suggest two optimisation techniques with reasons for minimizing the weight of the structure of this system. [10,10,10]

II.[a] How use of material index helps optimum selection of material and optimum design of a mechanical component? Illustrate. [10]

[b] Illustrate the steps for identifying design variables and optimisation problem formulation in the case of minimizing the size of a spur gear set using Rosenbroek method. [10]

[c] Explain the optimization method of Genetic Algorithm [GA] using its analogy with nature. What are its unique advantages? [10]

Part B

III A tank with 2 cubic meters capacity needs to be optimised for its configuration; what are optimisation techniques which can be used and Why? Solve the problem by choosing one of these methods. [10,20]

IV. A container for a cold drink is to be designed optimally; the container would be mass-produced; What objective[s] and constraints you would choose and why? Suggest feasible combinations of materials, processes and configuration. Which material index would be most appropriate and why? [10, 10, 10]