

Max. Marks 60

Notes: *Data handouts and Shigley Book are permitted for reference.*

1 [a] Estimate the initial diameter of a screw used in a screw jack to lift a car weighing 25000N. Assume a lift of 140mm.

[b] What constraints and objectives you would like to fulfil in the product using above screw so that it is acceptable by various personnel involved in its Design Cycle.

[10,10]

2 [a] What requirements/ constraints you would like to satisfy while estimating initial design of a shaft? How would you ensure dynamic soundness of this shaft? Can Modal Testing, FEM updating and SDM help? How?

[b] Make an initial selection of a deep-groove ball bearing for a radial load of 2000N and axial load of 750N. The shaft speed is 500rpm and its diameter is 40mm. The expected life is 5 years for one shift/ day of 200 days/year of operation in a medium duty machine tool application.

[10,10]

3 [a] Describe briefly the method of Multi objective decision making with the help of an example.

[b] Explain the Engineering creativity method of Morphological analysis based Synthesis

[c] Make an initial estimate of the module of a spur gear for transmitting 9 kW of power at 900 rpm. The designer has been advised to prefer 25 degree system and material advised is AISI 4130 Q&T 205 deg C. The gear is meant for a heavy duty application of a gear box for 3 shift operation.

[5,5,10]