

Total No. of Questions : 10]

SEAT No. :

P2846

[4958]-1021

[Total No. of Pages : 3

T.E. (Mechanical Sandwich Engineering)

MACHINE DESIGN

(2012 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer questions Q1 or Q2, Q3 or Q4 and Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What is Machine Design? Explain the traditional design procedure? [6]

b) Explain with neat sketch Goodman approach? [4]

OR

Q2) a) Explain design of flat and square key? [6]

b) What are the causes of stress concentration? [4]

Q3) a) Write equations to raise and lower the load? [4]

b) Derive an expression for Springs in parallel? [6]

OR

Q4) a) What are stresses in butt and fillet welds? [4]

b) A double threaded power screw with ISO metric trapezoidal threads is used to raise a load of 550KN. The nominal diameter is 120mm and pitch is 12mm. The coefficient of friction at screw threads is 0.25. Neglecting collar friction. Calculate Torques to lower the load. [6]

P.T.O.

Q5) a) A helical pinion having 14 teeth made of alloy steel ($S_{ut} = 800 \text{ N/mm}^2$) is mesh gear made of plain carbon steel 55 C8 ($S_{ut} = 700 \text{ N/mm}^2$). The gear pair is required to transmit 40 kW power from an electric motor running at 720 rpm to machine at 225 rpm. The application factor and load concentration factor are 1.3 and 1.1 respectively while the factor of safety is 2. The face width is $10 \times$ normal module ($10 M_n$) and tooth system is 20° full depth involute. Deformation factor for gear pair is $11000 e$, N/mm. design the gear pair by using the velocity factor and Buckingham's equation for dynamic load. [12]

b) Explain different types of gear lubrication methods? [6]

OR

Q6) a) The following data is given for a pair of spur gear with 20° full depth involute teeth. Number of teeth on pinion = 24, Number of teeth on gear = 56, Speed of pinion = 1200 rpm Module 3 mm, Service factor = 1.5, Face width = 30mm, factor of safety = 2. Both the gears made up of steel with an Ultimate tensile strength = 600 N/mm^2 . Using the velocity factor to account for the dynamic load calculate Beam strength, Velocity Factor. [12]

b) With neat sketch explain force analysis of spur gear? [6]

Q7) a) Derive Stribeck's equation for the basic static capacity of bearing. [6]

b) A single row deep groove ball bearing has a dynamic load capacity of 70000N and operates on following work cycle.

i) Radial load 7500 N at 500 rpm for 25% of the time. [10]

ii) Radial load 19000 N at 600 rpm for 50% of the time.

iii) Radial load 8000N at 400 rpm for 25% of the time.

Determine life of bearing in hours.

OR

- Q8)** a) Why there is need of rolling contact bearings? Write its application. [6]
b) Derive an expression for load life relationship? [10]

- Q9)** a) Write construction of V belt? [4]
b) A pulley of 1000 diameter is driven by an open type of flat belt from 20 KW at 1400 rpm electric motor. The pulley on motor shaft is 200 mm diameter and centre distance between the two shafts is 2m. The allowable tensile stress for the belt material is 2 N/mm² and coefficient of friction between belt and pulley is 0.15. Determine
i) The thickness of the belt
ii) The length of the belt
iii) The initial tension required in belt. [12]

OR

- Q10)** a) Explain the lubrication in chain drive? [4]
b) Design a chain drive to actuate a compressor from 15kW electric motor running at 1,400 rpm, the compressor speed being 450 rpm. The minimum centre distance is 500 mm. The compressor operates 16 hours per day. The chain tension may be adjusted by shifting the motor. [12]

