SQ-114

Seat No.	

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T.Y.B.Tech. (Part - III) (Semester -VI) (CBCS)
Examination, May-2025
MECHANICAL
Machine Design - II
Sub. Code : 81526/81803

Day and Date : Wednesday, 21/05/2025 **Total Marks : 70**

Time : 02:30 p.m. to 05:00 p.m.

Instructions : 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable data if necessary and state clearly.
4) Use of non-programmable calculator is allowed.

Q1) A) Define stress concentration and their causes. **[5]**

OR

Draw Soderberg, Goodman and Gerber line diagram. Explain its significance in the design of fluctuating loads.

B) The work cycle of a mechanical component subjected to completely reversed bending stresses consists of the following three elements : **[7]**

i) ± 350 N/mm² for 85% of time

ii) ± 400 N/mm² for 12% of time

iii) ± 500 N/mm² for 3% of time

The material for the component is 50C4 (Sut = 660 N/mm²) and the corrected endurance limit of the component is 280 N/mm². Determine the life of the component.

P.T.O.

Q2) A) Explain the role of friction, wear and lubrication in design of bearing. **[5]**

OR

Explain the procedure for the selection of bearing using manufacturer's catalogue.

B) A ball bearing is subjected to a radial force of 2500 N and an axial force of 1000 N. The dynamic capacity of bearing is 7350 N. The values of X and Y factors are 0.56 and 1.6 respectively. The shaft is running at 720 rpm. **[6]**

Determine life of bearing in working hours.

Q3) A) Explain with a neat sketch the theory of hydrodynamic lubrication. **[5]**

OR

Discuss the various materials used for sliding contact bearing.

B) A following data is given for a 360° hydrodynamic bearing. **[7]**
Journal diameter = 50 mm, Bearing length = 50 mm, Radial load = 3.2 kN, Journal speed = 1490 rpm, Radial clearance = 0.05 mm, Viscosity of lubricant = 25 cP

Determine : i) Minimum oil film thickness

ii) Coefficient of friction

iii) Power lost in friction

I/d	ϵ	h_o/c	S	ø	(r/c)f	(Q/rcn_sl)
1	0.4	0.6	0.264	63.10	5.79	3.99
1	0.6	0.4	0.121	50.58	3.22	4.33
1	0.8	0.2	0.0446	36.24	1.70	4.62
1	0.9	0.1	0.0188	26.45	1.05	4.74
1	0.97	0.03	0.0047	15.47	0.514	4.82

Q4) A) Explain the different methods of gear construction. **[5]**

OR

Derive Lewis equation for beam strength of spurs gear. State the assumptions made in deriving an equation.

B) A pair of spur gears with 20^0 full depth involutes teeth consists of a 24 teeth pinion meshing with 48 teeth gear. The module is 6 mm and face width is 60 mm. The material for the pinion and gear is steel with an ultimate tensile strength of 450N/mm². The gears are heat treated to a surface hardness of 250 BHN. The pinion rotates at 1000 rpm and the service factor for the application is 1.5. Assume that velocity factor accounts for the dynamic load and the factor of safety are 2. Determine the rated power that gear can transmit. **[7]**

[Use Y for 24 teeth = 0.337.]

Q5) A) Explain with sketch the concept of formative or virtual number of teeth in the design of helical gears. **[5]**

OR

Explain with neat sketches force analysis in bevel gear.

B) A pair of straight bevel gears consists of a 30 teeth pinion meshing with a 45 teeth gear. The module and the face width are 6 mm and 50 mm respectively. The pinion as well as the gear is made of steel (Sut = 600 N/mm²) Calculate the beam strength of the tooth. [Take, Lewis form factor is 0.3767.] **[6]**

Q6) A) Discuss the thermal consideration in the design of worm and worm wheel drive. **[5]**

OR

Derive an expression for efficiency of worm gearing.

D) A pair of worm gear is designated as 1/40/10/4. **[7]**

Determine :

i) The center distance

ii) The speed reduction

iii) The dimensions of the worm

iv) The dimensions of the worm wheel