Seat No.

Total No. of Pages : 3

OCT-NOV 2025 WINTER EXAMINATION

1154 B.Tech. CBCS

Sub. Name: Machine Design - II

Sub. Code: 81526/81803

Day and Date: Tuesday ,16-12-2025 **Total Marks: 70**

Time: 10:30 AM To 01:00 PM

Instructions:
1. **All questions are compulsory**
2. **Assume suitable data wherever necessary and mention it boldly**
3. **Draw neat labelled diagrams wherever necessary**
4. **Figures to the right indicate full marks**

Special Inst.: Use of non-programmable calculator is allowed

Q1) A. a)Define Stress concentration and explain their causes OR **[5]**
a)Explain with the help of S-N Curve, the endurance limit and its significance in the design.

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

Q2)

a. a) Explain the procedure for selection of bearing using manufacture catalogue. **[5]**
OR
a) Explain the term static load carrying capacity ,dynamic load carrying capacity and equivalent load on bearing.

b. A single-row deep groove ball bearing has a dynamic load capacity of 40500 N and operates on the following work cycle: **[7]**
(i) radial load of 5000 N at 500 rpm for 25% of the time.
(ii) radial load of 10000 N at 700 rpm for 50% of the time; and
(iii) radial load of 7000 N at 400 rpm for the remaining 25% of the time.
Calculate the expected life of the bearing in hours.

Q3)

a. Explain the following terms with reference to hydrodynamic journal bearing. **[5]**
i) length to diameter ratio ii) unit bearing pressure

b. The following data is given for a 360° hydrodynamic bearing: **[7]**
Journal diameter = 100 mm, Bearing length = 100 mm ,
Radial load = 50 kN Journal speed = 1440 rpm ,
Radial clearance = 0.12 mm , Viscosity of lubricant = 16 cP
Calculate :(i) minimum film thickness; (ii) coefficient of friction
(iii) power lost in friction

l/d	ϵ	h_o/c	S	ø	(r/c)f	(Q/rcn$_s$l)
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. a)Derive Lewis equation for beam strength of spurs gear. OR **[5]**
a)Explain the different types of gear teeth failure stating their causes and remedies.

b. It is required to design a pair of spur gears with 20° full-depth involute teeth consisting of a 20-teeth pinion meshing with a 50 teeth gear. The pinion shaft is connected to a 22.5 kW, 1450 rpm electric motor. The starting torque of the motor can be taken as 150% of the rated torque. The material for the pinion is plain carbon steel Fe 410 (Sut = 410 N/mm2), while the gear is made of grey cast iron FG 200 (Sut =200 N/mm2). The factor of safety is 1.5. Design the gears based on the Lewis equation and using velocity factor to account for the dynamic load. **[7]**
(take Y for 20 teeth as 0.32 and Y for 50 teeth as 0.408)

Q5)

a. Explain with sketch the concept of formative or virtual no of teeth in the design of helical gears. **[5]**

b. b) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 40 teeth gear. The helix angle is 25° and the normal pressure angle is 20°. The normal module is 3 mm. **[7]**
Calculate (i) the transverse module; (ii) the transverse pressure angle;
(iii) the axial pitch; (iv) the pitch circle diameters of the pinion and the gear.

Q6)

a. a) Explain the force analysis in the design of worm and worm wheel drive. OR **[5]**
b) Explain force analysis of bevel gear.

b. A pair of worm gears is designated as,1/30/10/8 Calculate **[5]**
(i) the centre distance; (ii) the speed reduction; (iii) the dimensions of the worm; and (iv) the dimensions of the worm wheel

End Of Question Paper

Important Note for Chief Exam Officer / SRPD Coordinator / Sr Supervisor/ Student -
This Question Paper may be distributed for following Subjects as common code.
सदरची प्रश्नपत्रिका खालील विषयांकरिता वितरित करता येईल.

1] (101) Bachelor of Engineering (81803) Machine Design - II Part 3 SEM 6
2] (1154) B.Tech. CBCS (81526) Machine Design - II Part 3 SEM 6