

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, Dec 2023
B. Tech. (ME), Semester VI,

Roll No.....

ME1410: Machine Design

Time: 3hrs

Max. Marks: 50

Instructions to students:

1. Design Data Book is allowed in Exam.
 2. Do not write anything other than your roll number on question paper.
 3. Mention all the assumptions for your answers clearly.
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- Q. 1.1 Herringbone gear is used for. 2.0
(CO 3)
- Q. 1.2 Where do you use self-aligning ball bearings and spherical roller bearings? 2.0
(CO 3)
- Q. 1.3 Important observations obtained from Petroff's equation are. 2.0
(CO2)
- Q. 1.4 Suggest the type of sliding contact bearing use for rope conveyors also mention two advantages of hydrodynamic bearings over hydrostatic bearings. 2.0
(CO2)
- Q.1.5 State two important reasons for adopting involute curve for gear tooth profile 2.0
(CO 3)
- Q. 2.1 A ball bearing is subjected to a radial force of 2500 N and an axial force of 1000 N. The dynamic load carrying capacity of the bearing is 7350 N. The values of X and Y factors are 0.56 and 1.6 respectively. The shaft is rotating at 720 rpm. Calculate the life of the bearing. 10.0
(CO 2)
- Q. 2.2 A plowing machine manufacturer required to standardize nine different models of machine, ranging from 40 to 630 KN load carrying capacity. There is an expansion plan to further increase the number of models from 9 to 13 to fulfill the market requirement. Specify the load carrying capacity of the additional models. 10.0
(CO3)
- Q. 3.1 The following data is given for a pair of spur gears 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 and face width = 30 mm. Both gears are made of steel with an ultimate tensile strength of 600 N/mm². Using the velocity factor to account for the dynamic load, calculate 10.0
(CO3)

- (i) beam strength
- (ii) velocity factor;
- (iii) rated power that the gears can transmit without bending failure, if the factor of safety is 1.5.

Q. 3.2 A pair of parallel helical gears consists of an 18 teeth pinion meshing with a 45 teeth gear. 7.5 kW power at 2000 rpm is supplied to the pinion through its shaft. The normal module is 6 mm, while the normal pressure angle is 20° . The helix angle is 23° . Determine the tangential, radial and axial components of the resultant tooth force between the meshing teeth **10.0**
(CO3)

all the best!