

MMMD - 201**M.E./M.Tech., II Semester**

Examination, December 2015

Advance Machine Design**Time : Three Hours****Maximum Marks : 70****Note :** i) Use of design data book is permitted.

ii) Solve any five questions.

iii) All questions carry equal marks.

1. Design a link mechanism when the motion of the input and output links is governed by a function $x = 4ay^2$ where y varies from 0 to 4 with an interval of 2. Make suitable assumptions and mention the assumptions clearly in the solution of the question.
2. Design a compound gear train for an exact velocity ratio (train ratio) of 360:1. Find the combination of gears that will give the required ratio.
3. The compressor of a machine running at 300 r.p.m is driven by a 15kW, 1200 r.p.m motor through a $14\frac{1}{2}^\circ$ full depth gears. Assuming a centre distance of 375cm and medium shock condition, complete the design calculations. The driven gear is to be made of cast steel. The motor pinion is to be of C-30 forged steel hardened and tempered.

4. a) Explain the mechanism of forces in a rigid body system and hence deduce an expression of mathematical model of it.
b) Explain the phenomenon of JUMP and CROSSOVER SHOCK of a cam.
5. Assuming the torque at the starting is 1.3 times the torque at rating determine the proportions of a SPUR GEAR DRIVE to transmit 0.8kW from a shaft rotating at 1170 r.p.m to a low speed shaft with a speed reduction of 6:1. Assuming that the teeth are 20° full depth system with 24 teeth on the pinion the gear is to be made of SAE 1030 steel and the pinion is to be made of SAE 1045.
6. Design a Dual Dwell cam to move a follower from 0 to 60mm in 75° , dwell for 75° , fall 60mm in 75° and a dwell for a further period of cam rotation. The total cycle must take 10seconds. Using a 4-5-6-7 polynomial function for rise plot the required curves.
7. Define the following:
 - a) SURGE and WINDING
 - b) CONJUGATE TEETH ACTION and ITS PROPERTIES
 - c) Types of KINEMATIC SYNTHESIS
 - d) DISC CAM and ITS APPLICATIONS
8. When two equal gears mesh without interference show that the minimum number of teeth T of these gears must satisfy the relation.

$$3T^2 \sin^2 \alpha - 4fT - 4f^2 = 0$$
