

Enroll No

**Rajarambapu Institute of Technology, Rajaramnagar**  
 (An Autonomous Institute, affiliated to SUK)  
 Mid Semester Examination (Sept. 2025)  
 Final year B.Tech. Sem- VII  
**Course Code:** AT461  
**Course Name:** Auto System Design

M 29

Day &amp; Date: Friday 19/09/2025

Max Marks: 100

Time : 10:15 To 12:15

**Instructions:**

- 1) All questions are compulsory
- 2) Figures to the right indicate maximum marks
- 3) Assume suitable data if not given
- 4) Use of non-programmable calculator is allowed

	Marks	COs	BT Level
Q.1 Solve any three.			
(a) Explain with the example design for machining (DFM) (Different machining processes -2 marks, explanation with example-4marks)	06	1	2
(b) Describe the problems occurred while solving tolerance relations in dimensional chains (3 cases 06marks)	06	1	3
(c) What is tolerance analysis? Justify the role of tolerance analysis in system design	06	1	3
(d) Draw Gauss curves for various values of standard deviations and Yield of process for centric and non-centric design (2 marks for each)	06	1	3
Q.2 Attempt the following			
(a) Explain the design requirements of a friction clutch. (1 mark for each point)	06	2	1
(b) A plate clutch having a single driving plate with contact surfaces on each side is required to transmit 110 kW at 1250 r.p.m. The outer diameter of the contact surfaces is to be 300 mm. The coefficient of friction is 0.4. (a) Assuming a uniform pressure of $0.17 \text{ N/mm}^2$ ; determine the inner diameter of the friction surfaces. (4 marks) (b) Assuming the same dimensions and the same total axial thrust, determine the maximum torque that can be transmitted and the maximum intensity of pressure when uniform wear conditions have been reached. (6marks)	10	2	4



OR

- b) The contact surfaces in a cone clutch have an effective diameter of 80 mm. The semi-angle of the cone is  $15^\circ$  and coefficient of friction is 0.3. Find the torque required to produce slipping of the clutch, if the axial force applied is 200 N. The clutch is employed to connect an electric motor, running uniformly at 900 r.p.m. with a flywheel which is initially stationary. The flywheel has a mass of 14 kg and its radius of gyration is 160 mm. Calculate the time required for the flywheel to attain full-speed.  
(Torque required to produce slipping of the clutch- 5marks  
Time required for the flywheel to attain full-speed -5marks)

Q.3 Solve any two

- (a) Design a 3-speed constant mesh gearbox having gear ratio of 3.6 in bottom and reverse gear. The layshaft and main shaft are 12cm apart approximately. Take module 3.5mm. Top gear has got unity gear ratio. Find exact gear ratio.  
(Geometrical progression -2marks, no of teeth- 6marks)
- (b) In sliding mesh gear box with four forward and one reverse speed explain clearly how different speed ratios will be obtained in the following cases  
Gear ratio in top gear = 1:1      Gear ratio in second gear = 2.24:1  
Gear ratio in third gear = 1.38:1      Gear ratio in first gear = 3.8:1  
Gear ratio in reverse gear = 3.8:1  
Assume counter shaft speed is half that of the engine speed and smallest gear is not have less than 15 teeth.  
(Speed ratios in each gear-2marks)
- (b) A four-speed gear box is to be constructed for providing the ratios of 1.0, 1.4, 2.28, and 3.93 to 1 as nearly as possible. The diametral pitch of each gear is 3.25mm and smallest pinion is to have at least 15teeth. Determine the suitable number of teeth of different gears. What is the distance between the main shaft and lay shaft?  
(No of teeth -6marks, distance between the main shaft and lay shaft. 2marks)

