

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/ Backlog), November-December 2015

B. Tech Mechanical Engineering, Semester V

COURSE CODE: ME 507

COURSE TITLE: Dynamics of Machines

Roll No.....

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. The motion of the follower is usually of the type:
 - a. Uniform velocity
 - b. Simple harmonic
 - c. Cycloidal
 - d. All of the above
- ii. The angle of contact at smallest pulley is taken in to consideration while using tension equation $T_1/T_2 = e^{\mu\theta}$ because:
 - a. The smaller pulley is weak as compared to the larger pulley
 - b. The smaller pulley is always taken as driving pulley
 - c. The belt slipping occurs first on the smaller pulley
 - d. The angle of lap on the smaller pulley is smaller than on the larger pulley
- iii. Self locking is not possible in case of:
 - a. Differential band brake
 - b. Simple band brake
 - c. Internal expanding shoe brake
 - d. Simple block brake
- iv. The condition of correct gearing is stated as:
 - a. Pitch line velocities of teeth should be the same
 - b. Radius of curvature of the two profiles is the same
 - c. Common normal to the pitch surface should cut the line joining the centers at a fixed point
 - d. None of the above
- v. The function of a governor is to:
 - a. Smoothen the cyclic fluctuations of speed
 - b. Help to start the engine
 - c. Take care of output fluctuations and control the input accordingly
 - d. Store up the energy and give up whenever required during cycle
- vi. The follower remains in contact of the cam by:
 - a. Weight of the follower
 - b. Shape of the follower
 - c. Shape of the Cam

- d. None of the above
- vii Belt is a
- Power transmission device
 - Power enhancing device
 - Only a connecting device
 - None of the above
- viii V-belt is superior to the flat belt:
- More area of contact
 - Belt size is small
 - Slack does not take place
 - None of the above
- ix Gyroscope is a
- Controlling device
 - Rotation transmission device
 - Optical measuring device
 - None of the above
- x Gear is better than other power transmission device because:
- High efficiency
 - Occupies small space
 - Multiple transmission
 - None of the above

Q.2 Short answer type questions 10

- Describe the importance of pressure angle in cam design
- Which pulley angle of contact is considered for belt design and why?
- Describe the differential band brakes with its operating conditions.
- Which effect is experienced while a two wheeler or four wheeler takes turn

Q.3 Draw the displacement diagram of a cam knife edge follower having follower axis passing through the axis of cam shaft from the following data: 10

- Follower to move outward through 30 mm with simple harmonic motion during 120° of cam rotation
- Follower to dwell for the next 60°
- Follower to return to its original position with uniform velocity during 90° of cam rotation
- Follower to dwell for the rest of cam rotation

The least radius of the cam is 20 mm and cam rotates at 240 rpm. Also calculate:

- Maximum velocity and acceleration of the follower during rise
- Maximum velocity and acceleration of the follower during return

Q.4 An flat belt connects two pulleys. The smaller pulley is of 400 mm diameter. The angle of contact on the smaller pulley is 160° and coefficient of friction between belt and pulley is 0.25. How much power that can be transmitted if the coefficient of friction is increased by 10% using suitable dressing on the belt? 10

Q.5 The brake drum of single block brake of diameter 300 mm is rotating at 400 rpm. 10

The force required at the end of the lever to apply the brake is 600 N. If angle of contact is 90° and coefficient of friction between the drum and brake block is 0.3, find the braking torque. Following are the other data:
Length of the lever = 610 mm, The lever is bent at 90° at 250 mm from drum center with 60 mm after the bend where it is pinned. The minimum thickness of the brake block is 20 mm. Draw the schematic of drum and brake with lever.

- Q.6 Describe the stability of four wheeler at the turn with diagram and derive the expression for balancing couple due to four wheels. 10

OR

- Q.6 A disc of mass 12 kg is mounted on one end of horizontal arm of the length 150 mm. The other end of the arm can rotate freely on a bearing. The radius of gyration of the disc is 200 mm. The disc is given a clockwise spin of 480 rpm about its axis which is horizontal. If the arm remains horizontal, determine: 10
- The angular velocity with which the spin axis will precess about y - axis.
 - The direction of the angular velocity of precession.

- Q.7 A pinion having twenty three teeth drives a gear having 57 teeth. The profile of the gear is in involute with pressure angle of 20° , module of 8 mm and addendum is equal to module. Calculate: 15
- Length of path of contact
 - Arc of contact
 - Contact ratio

OR

- Q.7 In a reverted epi cyclic gear train, the arm carries two gears A and D and a compound gear B-C. The gear A meshes with gear B and gear D meshes with gear C. The numbers of teeth on wheel A, D and C are 80, 48, 72 respectively. Find the speed and direction of gear D when gear A is fixed and arm makes 200 rpm clockwise. Solve the problem after sketching the gear train with the given nomenclature. 15

- Q.8 Calculate the minimum and maximum speed and range of speed of a porter governor which has equal arms each 200 mm long and pivoted on the axis of rotation. The mass of each ball is 4 kg and the central mass on the sleeve is 20 kg. The radius of rotation of the ball is 100 mm when governor begins the lift and 130 mm when the governor is at maximum speed. 10

- Q.9A Write a note on balancing of rotating masses with examples. 5
- Q.9B A wheel has an unbalanced mass of 20 kg with 250 mm from the axis of rotation is to be balanced by a balancing mass of 5 kg. Find the radius at which the center of gravity of balancing mass should be placed. 10

OR

- Q.9B A wheel has unbalanced mass of 10 kg at a radius of 50 mm. Determine the balancing mass required in two planes at 40 mm and 50 mm radii on the same side with the distance between the balancing planes be equal to 1 m and one balancing mass is 0.1 m from unbalanced mass. 10