

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

EndTerm Examination (Regular/Backlog), November-December 2015

B. Tech in Mechanical Engineering, Semester V

Roll No.....

COURSE CODE: ME 507

Time: 3 hours

Max. Marks: 100

COURSE TITLE: Dynamics of Machines

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

- i. If one body rotates an axis about which the body is rotating is called:
 - a. Rotary motion
 - b. Translational motion
 - c. Precessional motion
 - d. None of the above
- ii. Governor controls
 - a. Combustion engine
 - b. Controls the speed
 - c. Controls the vibration
 - d. Controls the oscillations
- iii. Dynamometer is a device to:
 - a. Measure a force
 - b. Moment of force
 - c. Power
 - d. All of the above
- iv. A brake can be used as dynamometer if one:
 - a. Can measure the braking force
 - b. Can only be done if it is shoe brake
 - c. Can not be used
 - d. None of the above
- v. Cam is a device which can convert:
 - a. Any motion to other motion
 - b. Only linear motion to linear motion
 - c. Only power
 - d. None of the above
- vi. Base circle of a cam is:
 - a. Smallest circle from cam center to profile
 - b. Large circle from the cam center to profile
 - c. Smallest distance of the follower from cam center
 - d. Largest length of the cam
- vii. Slip of the belt is due to :

- a. Lack of friction
 - b. Lack of tension
 - c. More slackness
 - d. All of the above
- viii Gyroscope is used for:
- a. Stabilizing a ship
 - b. Vibration control of equipment
 - c. Angular velocity of wheel
 - d. None of the above
- ix, Every gear should follow:
- a. Law of gear
 - b. Laws of friction
 - c. Laws of reaction
 - d. None of the above
- x Porter governor has:
- a. No arms
 - b. Four arms
 - c. Two arms
 - d. None of the above

- Q.2 a. List the nomenclature of cam. 10
 b. Describe the difference between belt and chain
 c. Describe the parameters on which effectiveness of force applied on differential band brake depends
 d. Describe the limitations of gear and gear trains
- Q.3 A cam rotates at 50 rpm at constant velocity. After a certain dwell period the follower must start to rise at constant acceleration and reach a speed of 200 mm/s and keep this velocity for 60° crank rotation. The follower must then move by constant deceleration till it has a rise of 60 mm and dwell. Assume equal rise for each constant acceleration and deceleration period. Compute maximum deceleration and acceleration at rise. 10
- Q.4 A flat belt is required to transmit 10 kw from a pulley of 1 m diameter running at 200 rpm to another pulley which runs at 400 rpm. The distance between the pulleys is 2.5 m. The following data refers to open belt drive: 05
 $\mu = 0.25$
 Safe working stress for belt = 1.75 N/mm²
 Density of belt material = 10×10^{-6} N/mm³
 Thickness of the belt = 10 mm
 Determine the width and length of the belt taking centrifugal force in to account.
- 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:
i. 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

i. Length of path of contact

ii. Arc of contact

Contact ratio

OR

Q.7 In a reverted epicyclic 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 Determine 10

i. Maximum speed

ii. Minimum speed

iii. Range of speed

of watt governor. The length of the arm is 215 mm when angle of the arm changes from 40° to 30°

Q.9A Determine 10

i. Minimum speed

ii. Range of speed

Of a watt governor, in which length of arm is 200 mm and is connected to the rotating spindle by 15 mm rod. When the angle change from 40° to 30° .

Q.9B What is balancing of rotating mass? Describe with mathematical derivations about balancing four different unbalanced masses at different planes. 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 either side of the unbalanced mass. The distance between the balancing masses is 1 m and one balancing mass is 0.1 m from the unbalanced mass. 10