Exam No: _____

GANPAT UNIVERSITY

B. TECH SEM- III (ME/MC/ME Int.)

CBCS (NEW) REGULAR EXAMINATION - NOV-DEC 2015

2ME302 - KINEMATICS OF MACHINES

TIME: 3 HRS **TOTAL MARKS: 60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1

(A) Describe a method to draw an Ellipse by Elliptical Trammel. **(03)**

(B) In a pin jointed four bar mechanism ABCD, the length of various links are as follows: - **(07)**
AB = 25 mm, BC = 87.5 mm, CD = 50 mm and AD = 80 mm.
The link AD is fixed and angle BAD = 135°. If the velocity of B is 1.8 m/s in the clockwise direction. Find 1) Velocity and acceleration of the mid-point of BC, and 2) Angular velocity and angular acceleration of link CB and CD.

OR

Q.1

(A) Describe the Watt's straight Line Mechanism. **(03)**

(B) In a four bar chain ABCD, link AD is fixed and the crank AB rotates at 10 rad/sec clockwise. **(07)**
Lengths of the links are AB = 60 mm, BC = CD = 70 mm, DA = 120 mm. When angle DAB = 60° and both B and C lie on the same side of AD. Find (i) Angular velocities (magnitude and direction) of BC and CD, and (ii) Angular acceleration of BC and CD.

Q.2

(A) What is a Brake? Enlist the various types of Brake and explain the working of any one of them with neat sketch. **(05)**

(B) A torsion dynamometer is fitted on a turbine shaft to measure the angle of twist. It is observed that the shaft twists 1.5° in length of 5 m at 500 RPM. The shaft is solid and has a diameter of 200 mm. If the modulus of rigidity for the shaft materials is 85 GPa, find the power transmitted by the turbine. **(05)**

OR

Q.2

(A) Explain with help of a neat sketch working of a Bevis-Gibson Torsion Dynamometer. **(05)**

(B) A simple band brake is operated by a lever of length 1000 mm. The brake drum has a diameter of 600 mm and the brake band embraces 4/7 of the circumference. One end of the band is attached to the fulcrum of the lever while the other end is attached to a pin on the lever 200 mm from the fulcrum. If the effort applied to the end of the lever is 5 KN and the coefficient of friction is 0.3, find the maximum braking torque on the drum. **(05)**

Q.3 Attempt any TWO. **(10)**

(A) Derive the condition for Correct Steering.

(B) What is Straight Line Mechanism? Enlist the straight line mechanism and explain any one.

(C) Explain with help of a neat sketch working of a Rope Brake Dynamometer.

SECTION: II

Q.4

(A) Define the following terms used in cams: **(02)**
(i) Trace point,
(ii) Pressure angle

(B) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below : (08

i) To raise the valve through 50 mm during 120° rotation of the cam ;
ii) To keep the valve fully raised through next 30°;
iii) To lower the valve during next 60°; and
iv) To keep the valve closed during rest of the revolution i.e. 150° ;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of the stroke is offset 15 mm from the axis of the cam shaft. The displacement of the valve, while being raised with uniform acceleration and deceleration and lowered, is to take place with simple harmonic motion.

OR

Q.4

(A) Define the following terms (02)
(i) coefficient of friction
(ii) limiting angle of friction

(B) Draw a cam profile to drive an oscillating roller follower to the specifications given below : (08)
(i) Follower to move outwards through an angular displacement of 20° during the first 120° rotation of the cam ; (ii) Follower to return to its initial position during next 120° rotation of the cam ; (iii) Follower to dwell during the next 120° of cam rotation.

The distance between pivot centre and roller centre = 120 mm; distance between pivot centre and cam axis = 130 mm; minimum radius of cam = 40 mm; radius of roller = 10 mm; inward and outward strokes take place with simple harmonic motion.

Q.5

(A) Deduce an expression for the efficiency of an inclined plane when a body moves (i) Up a plane, (ii) Down a plane. (05)

(B) In an epicyclic gear train, the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. E gears with A and C and F gears with B and D. All the wheels have the same module and the number of teeth is: TC = 28; TD = 26; TE = TF = 18. (05)

i) Sketch the arrangement;
ii) Find the number of teeth on A and B ;
iii) If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B; and
iv) If the arm G makes 100 r.p.m. clockwise and wheel A makes 10 r.p.m. counter clockwise; find the speed of wheel B.

OR

Q.5

(A) Explain sliding gear box. (05)

(B) An effort of 1500 N is required to just move a certain body up an inclined plane of angle 12°, force acting parallel to the plane. If the angle of inclination is increased to 15°, then the effort required is 1720 N. Find the weight of the body and the coefficient of friction. (05)

Q.6 Attempt Any TWO. (10)

(A) What are uniform pressure and uniform wear theories? Deduce expression for friction torque considering both theories for conical collar.

(B) Explain simple gear train with neat sketch.

(C) Explain Differential gear box.

----------END OF PAPER----------