KATHMANDU UNIVERSITY
End Semester Examination [C]
January, 2018

Mark Score:

Level : B.E.
Year : II
Course : MEEG 206
Semester: II

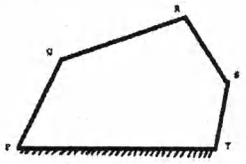
Exam Roll No. :
Time: 30 mins.
F. M. : 20

Registration No.:
Date JAN 09 2018

SECTION "A"
[20 Q. × 1 = 20 marks]

Complete *ALL* questions in this section. Indicate your answer with an X in the appropriate box. Assume any data if missing.

1. Which type of mechanism is shown below?



[ ] Constrained
[ ] Locked
[ ] Unconstrained
[ ] Unlocked

2. A rigid body in space has
[ ] One translational motions and three rotational motion
[ ] Two translational motions and four rotational motion
[ ] Three translational motions and three rotational motion
[ ] Three translational motions and two rotational motion

3. If there are L number of links in a mechanism then number of possible inversions is equal to
[ ] L+1 [ ] L-1 [ ] L [ ] L+2

4. The velocity of sliding of meshing gear teeth is
(Where ω_1 and ω_2 are angular velocities of meshing gears and 'y' is distance between point of contact and the pitch point)
[ ] $(\omega_1 + \omega_2)\, y$ [ ] $(\omega_1/\omega_2)\, y$ [ ] $(\omega_1 \times \omega_2)\, y$ [ ] $(\omega_1+\omega_2)/y$

5. A kinematic chain has 'n' links. the possible number of inversions is
[ ] n [ ] n-1 [ ] n+1 [ ] n+2

6. A negative degree of freedom for a mechanism means?
[ ] constrained motion mechanism
[ ] unconstrained motion mechanism
[ ] any motion
[ ] statically indeterminate structure

7. In which of the following gear train the first gear and the last gear are co-axial
[ ] simple gear train
[ ] Compound reverted gear train
[ ] Reverted gear train
[ ] Epicyclic gear train

8. The size of a gear is usually specified by
[ ] Pressure angle [ ] circular pitch
[ ] diametral pitch [ ] pitch circle diameter

9. In a cam drive with uniform velocity follower, the sharp corners of the displacement diagram are rounded off at the beginning and at the end of each stroke. This is done
[ ] because of difficulty in manufacturing cam profile
[ ] because of loose contact of follower with cam surface
[ ] in order to have acceleration in beginning and retardation at the end of stroke within the finite limits
[ ] because the uniform velocity motion is a partial parabolic motion

10. The cam follower generally used in automobile engines is
[ ] knife edge follower [ ] fiat faced follower
[ ] spherical faced follower [ ] roller follower

11. A fixed gear having 300 teeth is in mesh with another gear having 50 teeth. The two gears are connected by an arm. The number of turns made by the smaller gear for one revolution of arm about the center of bigger gear is
[ ] 2 [ ] 3 [ ] 6 [ ] 4

12. Which gear train is used for higher velocity ratios in a small space?
[ ] Simple gear train [ ] Reverted gear train
[ ] Epicyclic gear train [ ] Compound gear train

13. The ratio of tension of the two side of a rope drive is given by
[ ] $e^{-\mu\theta cosecA}$ [ ] $e^{\mu\theta cosecA}$
[ ] $e \times \mu \times \theta$ [ ] None of the above

14. The efficiency of the flat belt drive is 35%. If the parameters are same and the flat belt is replaced by V- belts, then the efficiency of V- belt will be
[ ] <35% [ ] Equal
[ ] >35% [ ] Can't be determined

15. Creep in the belt drive is due to
[ ] Material of the pulley
[ ] material of the belt
[ ] larger the size of the driver pulley
[ ] Uneven extensions and contractions due to varying tension

16. Whirling speed of the shaft is the speed at which
[ ] shaft tends to vibrate in longitudinal direction
[ ] torsional vibrations occur
[ ] shaft tends to vibrate vigorously in transverse direction
[ ] combination of transverse and longitudinal vibration occurs.

17. In order to have a complete balance of a several revolving
[ ] Masses in different planes the resultant couple must be zero
[ ] the resultant force must be zero
[ ] both the resultant couple and force must be zero
[ ] the resultant couple must be 100%

18. For high speed engines, the cam follower should move with
[ ] uniform velocity [ ] simple harmonic motion
[ ] uniform acceleration and retardation [ ] cycloidal motion

19. A disturbing mass m_1 attached to the rotating shaft may be balanced by a single mass m_2 attached in the same plane of rotation as that of m1, such that (where r1 and r2 are the radii of rotation of m1 and m2 respectively)
[ ] $m_1r_2 = m_2r_1$ [ ] $m_1r_1 = m_2r_2$ [ ] $m_1m_2 = r_1r_2$ [ ] $m_1m_2 = r_1/r_2$

20. In under damped vibrating system, the amplitude of vibration
[ ] decreases linearly with time [ ] increases linearly with time
[ ] decreases exponentially with time [ ] increases exponentially with time

KATHMANDU UNIVERSITY
End Semester Examination [C]
January, 2018

JAN 09 2018

Level : B.E.
Year : II
Time : 2 hrs. 30 mins.

Course : MEEG 206
Semester: II
F.M. : 55

SECTION "B"

Attempt *ALL* questions, Assume any data if missing.

1. a. In a pin jointed four bar mechanism, as shown in figure 1, AB = 300 mm, BC = CD = 360mm, and AD = 600 mm. The angle BAD = 60°. The crank AB rotates uniformly at 100 r.p.m. locates all the instantaneous centers and find the angular velocity of the link BC. [7]

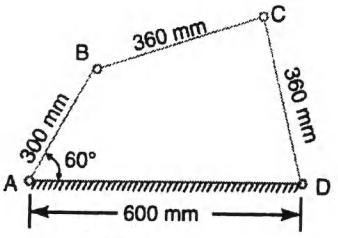


Figure. 1

b. Describe the following: [3×3=9]
   i. Grashofcondition
   ii. Types of Belt Drive
   iii. Whirling of a Shaft

2. A cam is to give the following motion to a knife-edged follower: [11]
   i. To outstroke during 60° of cam rotation
   ii. To dwell for the next 30° of cam rotation
   iii. To return stroke during next 60° of cam rotation , and
   iv. To dwell for the rest period of a revolution i.e. 210° of cam rotation

   The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft. Also write all steps of the process for drawing the cam profile.

3. An epicyclic train of gears is arranged as shown in Fig.2. How many revolutions does the arm, to which the pinions B and C are attached, make?
   a. When A makes one revolution clockwise and D makes half a revolution anticlockwise, and
   b. When A makes one revolution clockwise and D is stationary. The number of teeth on the gears A and D are 40 and 90 respectively. [8]

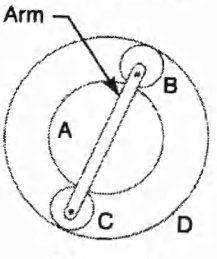


Figure. 2

4. A pulley is driven by a flat belt, the angle of lap being 120°. The belt is 100 mm wide by 6 mm thick and density1000 kg/m3. If the coefficient of friction is 0.3 and the maximum stress in the belt is not to exceed 2 MPa, find the greatest power which the belt can transmit and the corresponding speed of the belt. [7]

5. Calculate the whirling speed of a shaft 20 mm diameters and 0.6 m long carrying a mass of 1 kg at its mid-point. The density of the shaft material is 40 Mg/m^3, and Young's modulus is 200 GN/m^2. Assume the shaft to be freely supported. [6]

6. A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance. [7]