

23/6/2016

4E4140

Roll No. _____

Total No of Pages: **4**

4E4140

B.Tech. IV-Sem (Main & Back) Exam; June-July 2016

Automobile Engineering

4AE1A Kinematics of Machines

AE, ME

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Main & Back): 26

Min. Passing Marks (Old Back): 24

Instructions to Candidates:-

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. _____

2. _____

UNIT-I

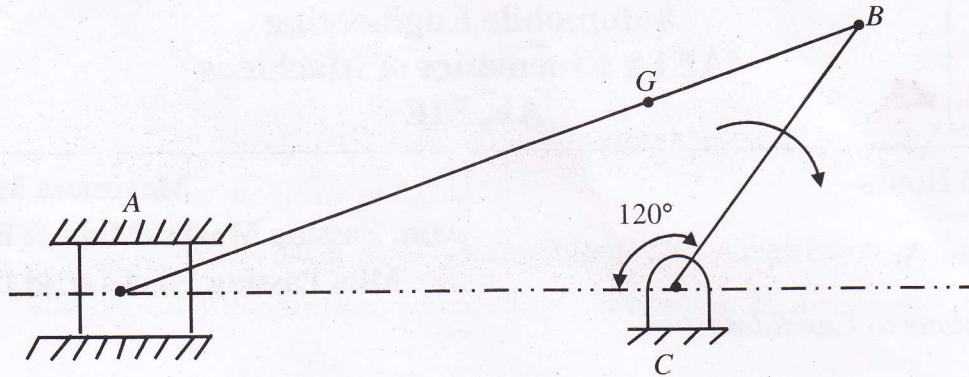
Q.1 (a) Sketch and explain the various inversions of a double slider crank chain. [8]

(b) Draw and explain Klien's construction for determining the velocity and acceleration of the piston in a slider crank mechanism. [8]

OR

Q.1 An engine mechanism is shown in figure. The crank CB = 100mm and the connecting rod BA = 300 mm with centre of gravity G, 100 mm from B. The crank shaft has a speed of 75 rad/s and an angular acceleration of 1200rad/s^2 . Find: [16]

- (i) velocity of G and angular velocity of AB and
- (ii) acceleration of G and angular acceleration of AB.



UNIT-II

- Q.2 (a) Derive an expression for the ratio of angular velocities of the shafts of a Hooke's joint. Sketch a polar velocity diagram and mark it's salient feature. [8]
- (b) What is the fundamental equation of steering gears? Derive the condition of correct steering for Davis steering gear mechanism. [8]

OR

- Q.2 (a) Draw and explain an overhead valve mechanism of an I.C. Engine. [8]
- (b) Two shafts are connected by a universal joint. The driving shaft rotates at a uniform speed of 1200 r.p.m. Determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100 r.p.m. Also calculate the maximum and minimum speeds of the driven shaft. [8]

UNIT-III

Q.3 (a) What are uniform pressure and uniform wear theories? Deduce expression for the friction torque considering both the theories for a flat collar. [8]

(b) A load of 15kN is raised by means of a screw jack. The mean diameter of the square threaded screw is 42mm and the pitch is 10mm. A force of 120 N is applied at the end of a lever to raise the load. Determine the length of the lever to be used and the mechanical advantage obtained. Is the screw self-locking? Take $\mu = 0.12$. [8]

OR

Q.3 (a) Derive the condition for maximum power transmission by a belt drive considering the effect of centrifugal tension. [8]

(b) Determine the maximum power transmitted by a V-belt drive having the included V – groove angle of 35° . The belt used is 18mm deep with 18mm maximum width and weighs 300 gm. per metre length. The angle of lap is 145° and the maximum permissible stress is 1.5N/mm^2 . Take $\mu = 0.2$ [8]

UNIT-IV

Q.4 (a) A single plate clutch transmits 25kw at 900 r.p.m. The maximum pressure intensity between the plates is 85 kN/m^2 . The outer diameter of the plate is 360 mm. Both the sides of the plate are effective and the coefficient of friction is 0.25. Determine the (i) inner diameter of the plate (ii) axial force to engage the clutch. [8]

(b) What is a Clutch? Make a sketch of a single plate clutch and describe its working. [8]

OR

- Q.4 (a) Show that in a band block brake, the ratio of the maximum and minimum tensions in the brake straps is :

$$\frac{T_0}{T_n} = \left[\frac{1 + \mu \tan \theta}{1 - \mu \tan \theta} \right]^n$$

Where T_0 = Maximum tension, T_n = Minimum tension 2θ = angle subtended by each block at the centre of the drum. [8]

- (b) What is the different between absorption and transmission dynamometers? Describe the construction and operation of a prony brake dynamometer. [8]

UNIT-V

- Q.5 (a) How are the cams classified? Describe in detail. [8]
(b) Deduce expression for the velocity and acceleration of the follower when it moves with simple harmonic motion. [8]

OR

- Q.5 Draw the profile of a cam operating a knife -edge follower having a lift of 30mm. The cam raises the follower with SHM for 150° of the rotation followed by a period of dwell for 60° . The follower descends for the next 100° rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform velocity of 120 r.p.m, and has a least radius of 20mm. What will be the maximum velocity and acceleration of the follower during the lift and the return. [16]
