CBCS Scheme

USN | | | | | | | | | | |

15AE44

Fourth Semester B.E. Degree Examination, June/July 2018
Mechanism and Machine Theory

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Describe the following : i) Kinematic link ii) Kinematic pair **(08 Marks)**

b. Define mobility of mechanism and determine mobility of following mechanism. **(08 Marks)**

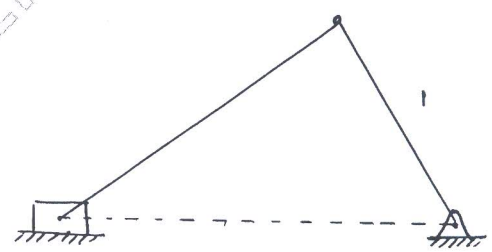

Fig Q1(b)

OR

2 a. Explain construction and working of peaucillier mechanism by means of a sketch. Prove that it generates an exact straight line. **(08 Marks)**

b. Sketch and explain the working of Ackermann steering gear. **(08 Marks)**

Module-2

3 In the mechanism shown in Fig Q3 crank rotates at 3000 rpm. Find the acceleration of the point 'C' in magnitude direction and sense. Find also the angular acceleration of link 3. **(16 Marks)**

$O_2A = 50mm$
$AB = 175mm$
$AC = 75\ mm$
$BC = 125\ mm$

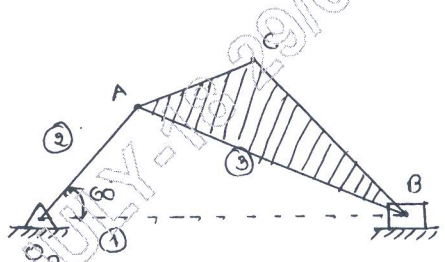

Fig Q3

OR

4 A four bar mechanism ABCD is made up of four links, pin pointed at the end. AD is a fixed link which is 180mm long. The links AB, BC and CD are 90mm, 120mm and 120mm long respectively. At certain instant, the link AB makes an angle of 60° with link 'AD' if the link 'AB' rotates at a uniform speed of 100rpm clockwise. Determine :

i) Angular velocity of the link 'BC' and 'CD'

ii) Angular acceleration of the link 'CD' and 'CB'. **(16 Marks)**

Module-3

5 a. Derive an expression for arc of contact for two meshing spur gears having involute profile. **(08 Marks)**

b. Two spur gears have 30 teeth each of involute shape the circular pitch is 25mm. pressure angle = 20°. Determine the addendum of wheels if arc of contact is twice the circular pitch. **(08 Marks)**

OR

6 a. Explain with sketches: i) Reverted gear train ii) Epicyclic gear train. **(08 Marks)**

b. An epicyclic gear train consists of a sunwheel 'S' a stationary internal gear (E) and three identical planet wheels (P) carried on a star shaped planet carrier (C). The size of different toothed wheels are such that the planet carrier 'C' rotates at 1/5 of the speed of the sun wheel. The minimum number of teeth on any wheel is 16. The driving torque on the sun wheel is 100Nm. Determine :

i) Number of teeth on different wheels of train

ii) Torque necessary to keep the internal gear stationary **(08 Marks)**

Module-4

7 a. Derive balancing of single revolving mass in two different planes. **(08 Marks)**

b. A, B, C and D are 4 masses carried by a rotating shaft at radius 100, 125, 200 and 150mm respectively. The planes in which the masses revolve are spaced 600mm apart and the masses B, C and D are 10, 5, 4 kg respectively. Find the required mass 'A' and the relative angular position of the 4 masses to kept the shaft in balance. **(08 Marks)**

OR

8 a. Show that for a 90° v-engine the primary forces can be balanced by a single balancing mass. **(08 Marks)**

b. In a 5 cylinder radial engine the cylinders are equally spaced. Mass of reciprocating parts per cylinder is 1 kg stroke length is 0.1m and length of C.R 0.15m. When the engine rotates at 3000 rpm find the maximum unbalanced primary and secondary forces.

Data $\Rightarrow$ M = 1kg, Stroke = 0.1m, r = 0.05m, ℓ = 0.15m, speed = 3000rpm. **(08 Marks)**

Module-5

9 a. Derive an expression for the height of porter governor. **(08 Marks)**

b. A porter governor has all the four arms of 300mm each. The upper arms as well as the sleeve arms are pivoted on the axis of rotation. The mass of each governor ball is 1kg. The mass of the sleeve is 20kg. Find the speed of rotation when the balls rotate at a radius of 15cms. If the frication forces between sleeve and spindle is 50N. Find the speed range during which governor is in sensitive at radius (of rotation of balls) = 15cms. If sleeve moves up by 3cm, what is the equilibrium speed? **(08 Marks)**

OR

10 a. Describe the effect of the gyroscopic couple on an aeroplane. **(08 Marks)**

b. An aeroplane makes a complete half circle of 40m radius towards left when flying at 175 km/hr. The mass of the rotary engine and propeller is 400kg with radius of gyration 300mm. The engine runs at 2500 rpm clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft. What will be the effect if the aeroplane turns towards right instead of left? **(08 Marks)**

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