

**B.Tech. MECHANICAL ENGINEERING
(COMPUTER INTEGRATED
MANUFACTURING) / BTMEVI**

Term-End Examination

00193

December, 2018

BME-020 : KINEMATICS & DYNAMICS OF MECHANISMS

Time : 3 hours

Maximum Marks : 70

*Note : Attempt any **five** questions. All questions carry equal marks. Use of non-programmable calculator is allowed. Make suitable assumptions wherever necessary. Standard symbols and notations have usual meaning.*

1. (a) Explain the following : 6
- (i) Machine
 - (ii) Kinematic link
 - (iii) Mechanism

- (b) A gun is placed on the roof of a building which is 50 m high. The muzzle velocity of the gun is 1000 m/s. Determine angle 'd' at which the gun should fire in order to hit a target at a distance of 30 km from the base of the building on level ground. 8
2. (a) Explain inversions of 4R kinematic chain. 12
- (b) Why does 4-R kinematic chain not provide four different mechanisms? 2
3. (a) State and prove Kennedy's Theorem. 6
- (b) Determine all the instantaneous centres of a single slider crank chain OAB shown in Figure 1. 8

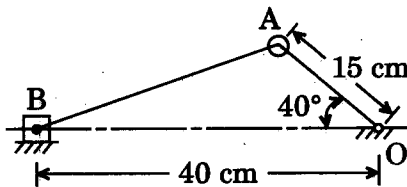


Figure 1

4. (a) Find expression for Coriolis component of acceleration. 4
- (b) Determine acceleration of piston by using Klein's construction for slider crank mechanism having crank length equal to 20 cm and connecting rod length as 80 cm for angles 0° , $\pi/2$ and π . Crank rotates at 12 rad/sec in CCW direction. 10

5. (a) Explain the selection of speed ratios for cone pulleys. 4
- (b) An open belt drive is required to transmit 25 kW. One of the pulleys has diameter 150 cm and speed 300 rpm. Find width of the belt if permissible stress in the belt is 300 N/cm^2 . The minimum angle of the contact is 165° . Assume $\mu = 0.32$. 10
6. (a) Explain the construction and working of vehicle differential. 6
- (b) Two mating gears having 30 and 45 teeth have 6 mm module. The pressure angle is 20° . If path of approach and path of recess are half of the maximum value possible, find addendum of each gear. 8
7. (a) Define 'equivalent dynamical system'. Explain its importance. 6
- (b) The flywheel of a generator set weighs 200 kg and its radius of gyration is 30 cm. The diameter of the flywheel shaft is 5 cm and length is 25 cm. Mass of armature is 100 kg and radius of gyration is 20 cm. The dynamo shaft is 4.2 cm in diameter and 20 cm long. Determine the frequency of torsional vibration and mode shape. 8

8. (a) Explain logarithmic decrement and derive its expression for spring mass system. 6
- (b) An accelerometer has crystal of natural frequency 20 kHz. The damping of the accelerometer is 0.5. Determine the highest frequency at which the accelerometer can be used with 1% accuracy. 8
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