

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

00073

**Term-End Examination**

**June, 2018**

**BME-020 : KINEMATICS & DYNAMICS OF MECHANISMS**

*Time : 3 hours*

*Maximum Marks : 70*

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**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.*

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1. (a) Show that the path travelled by the projectile is parabolic and prove that the maximum range is  $\frac{V_0^2}{g}$  and time of flight is  $\frac{2V_0 \sin \alpha}{g}$ .

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- (b) Explain the following : 6
- (i) Kinematic pairs
- (ii) Degrees of freedom
- (iii) Grübler's Criterion of Mobility
2. (a) Explain inversions of 3R-1P Kinematic Chain. 10
- (b) Explain Grashof's Criterion and its utility. 4
3. (a) Explain instantaneous centre of rotation. 4
- (b) If a mechanism has six links, how many instantaneous centres does it have? Out of them, how many are absolute instantaneous centres? Explain with an example. 10
4. (a) Explain the concept of 'Equivalent Mechanism' with a suitable example. 4
- (b) In a quick return motion mechanism, the crank OA is 15 cm long and rotates at 10 rad/sec in counter clockwise direction as shown in Figure 1. Determine angular acceleration of link BD. 10

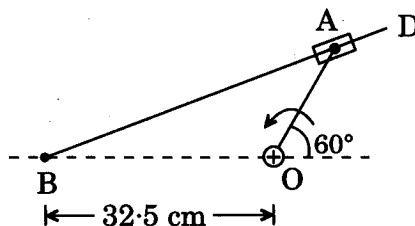


Figure 1

5. (a) Classify Gears. 6
- (b) A shaft carries a pulley of 100 cm diameter rotating at 500 rpm. The ropes drive another pulley with a speed reduction 2 : 1. The groove angle is  $40^\circ$  and power transmitted is 200 kW. The distance between the pulley centres is 2 m. The rope weighs 0.12 kg/m and the allowable stress is  $180 \text{ N/cm}^2$ . The initial tension in the rope is 850 N. Determine the number of ropes required and the rope diameter. Assume  $\mu = 0.25$ . 8
6. (a) Explain the construction and working of Wilson Gearbox. 8
- (b) Explain interference in involute gears and discuss methods to avoid it. 6
7. (a) In which type of I.C. engine, will speed fluctuations be maximum and why? 3
- (b) In a Hartnell governor, the radius of rotation is 6.5 cm at speed 450 rpm with ball arms vertical and sleeve at the mid position. The sleeve movement is 2 cm with a  $\pm 5\%$  change in speed. The mass of the sleeve is 6 kg and the friction is equivalent to 25 N at the sleeve. The ball mass is 2 kg. The ball arm and sleeve are equal in length. Find spring rate and initial compression in the spring. 11

8. (a) What do you mean by force analysis in gear drive ? Determine force components in helical gear. 6
- (b) Analyse vibration of beam/shaft due to its own weight by exact method and show first three modes of vibration along with their natural frequencies. 8
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