

**Roll No. ....**

**Total Pages : 03**

**BT-7/M-20**

**37176**

**ROBOTICS : MECHANICS AND CONTROL  
ME-431N (Opt. I)**

Time : Three Hours]

[Maximum Marks : 75

**Note** Attempt Five questions in all, selecting at least one question from each Unit. Unless stated otherwise, the symbols have their usual meaning in context with the subject. All questions carry equal marks.

**Unit I**

- 1.** Describe in detail the anatomy of an industrial robot. Describe the industrial applications of robots.
- 2.** An over drive for a vehicle consists of an epicyclic gear train, as shown in Fig. (1), with compound planets 'BC'. 'B' has 15 teeth and meshes with an annulus 'A' which has 60 teeth. The planet 'C' has 20 teeth and meshes with the sun wheel 'D' which is fixed. The annulus is keyed to the propeller shaft 'Y' which rotates at 740 rad/s. The spider which carries pins, upon which the planets revolve, is driven directly from main gear box by shaft 'X', this shaft being relatively free to rotate with respect to wheel

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**1**

'D'. Find the speed of shaft 'X', when all the teeth have the same module. What is the holding torque on the wheel 'D' if power is 130 kW ? Assume 100 per cent efficiency throughout.

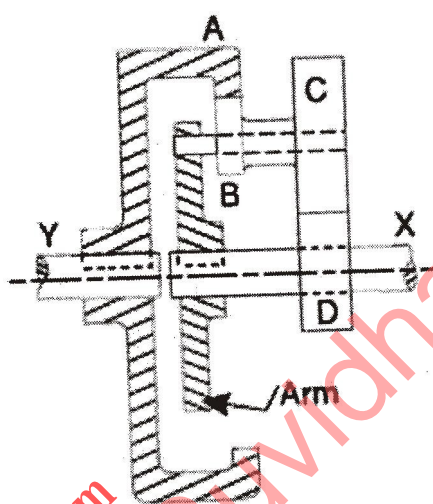


Fig. 1 Epicyclic gear train

## Unit II

3. Define End effector and Gripper. Name and explain in detail, various types of the grippers. **15**
4. Sketch the pneumatic circuits to control different motions of cylindrical and Cartesian coordinate's robot.

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### Unit III

5. Define transformation and derive an expression for the representation of a pure rotation about an axis. **15**
6. Explain the principle of sensing. Describe force sensing with strain gauge and wrist force sensor. **15**

### Unit IV

7. Explain in detail, the functions of work cell controller. Also, explain the working principle of mobile robot and its actuation. **15**
8. Describe in detail, the implementation of robotics in spray painting and undersea operations. **15**