

# \* AUTOMATION AND ROBOTICS :

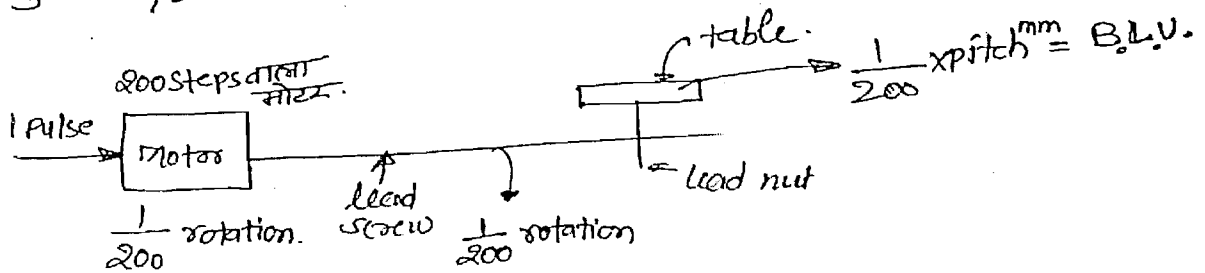
- High speed with slight error → Stepper motor
- feed → Servo motor (less speed)

$\frac{8}{59}$

## \* BLU :

Movement of the table corresponding to one pulse received by the motor is Basic length Unit (BLU).

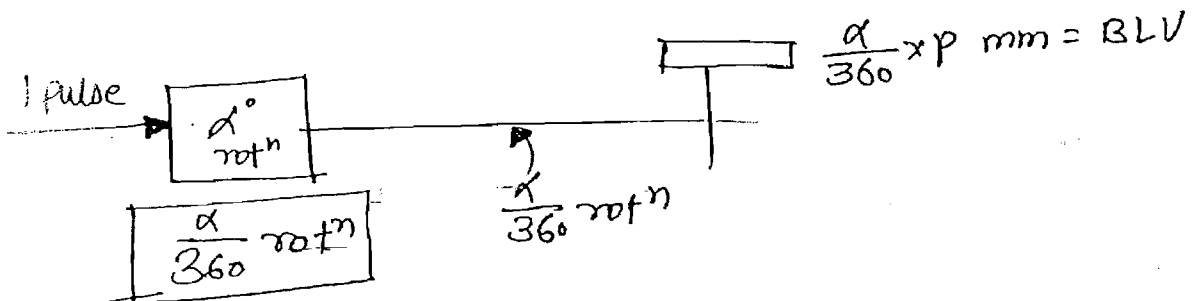
उदाहरण १ :



in 1 rotation table moves 1 pitch hence in  $\frac{1}{200}$  rot<sup>n</sup> =  $\frac{1}{200} \times \text{pitch}$

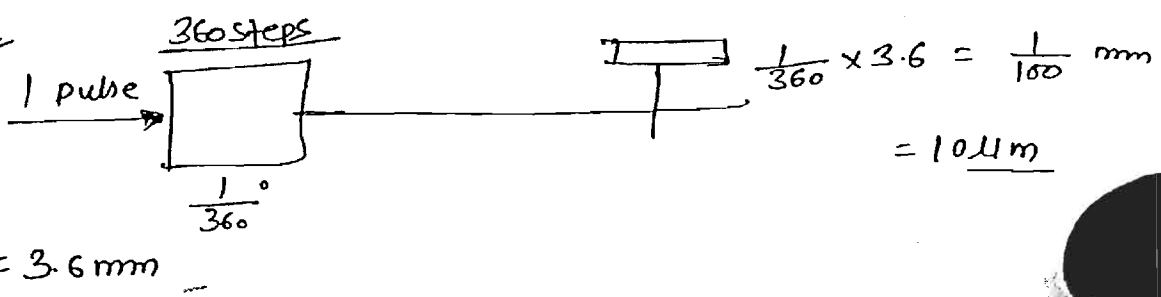
$$\frac{1}{200} \times p \text{ mm} \longrightarrow \frac{1}{200} \times p \times 1000 \text{ } \mu\text{m} = \text{BLU}$$

उदाहरण २ :

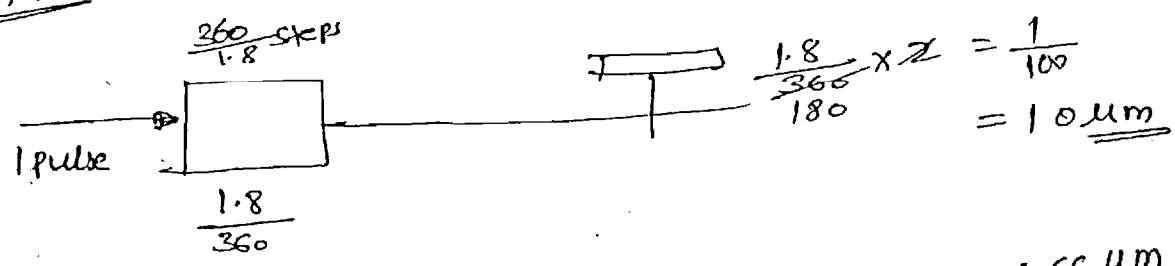


Reciprocal of this is number of steps in motor.

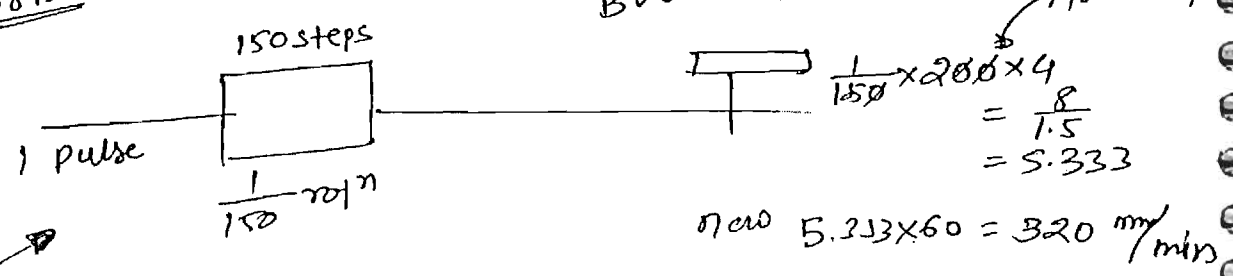
Q97



Q97 PE



Q108 PE



**जुगाड 3:-**

If frequency of pulse is 1000 Hz इसका मतलब 1 sec में 1000 pulse भेजेगे / इसका मतलब 1 मिनट 1000x60 pulse भेजेगे / उससे 1000x60x(BLU) mm टेबल का movement होगा / therefore table velocity or feed 1000x60xBLU mm/min

eg: for 200 steps

∴ SPEA = 200 pulse से 1 rotation,  
 1 " " "  $\frac{1}{200}$  rotation,  
 1000x60 " "  $\frac{1}{200} \times 60 \times 1000$  rotation

$$\text{RPM} = \frac{1}{200} \times 1000 \times 60 \text{ rotation min.}$$

**उदाहरण 4:** If motor rotates at 500 rpm मतलब  
 1 मिनट में 500 rotations हुआ / मतलब टैबल velocity / (feet)

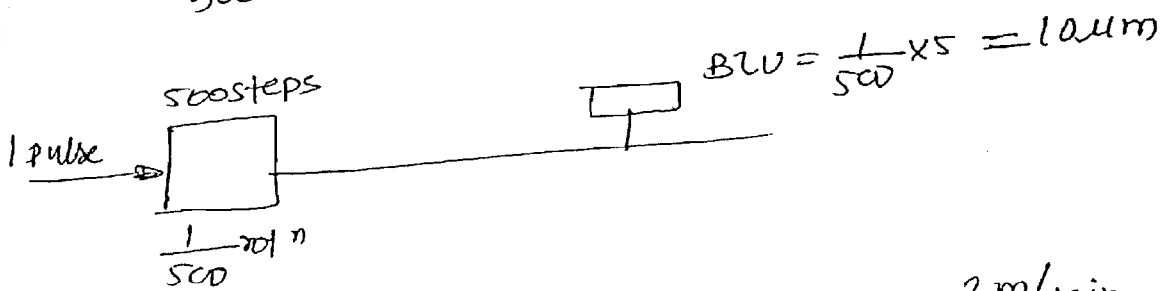
$$= 500 \times P \text{ mm/min}$$

मतलब 200 x 500 pulse/min bheja. (eg: pulse = 200)

$$\therefore \frac{200 \times 500}{60} \text{ pulse/s (or Hz) भेजा!}$$

**EXAMPLE:** 500 pulse/revolution  $\rightarrow$  500 steps वाला मोटर

$$\therefore \frac{1}{500} = \text{Rotation}, \text{ BLU} = \frac{1}{500} \times 5 = 10 \mu\text{m}$$



$$N = 600 \text{ rpm}, \therefore \text{velocity} = 600 \times 5 = 3 \text{ m/min}$$

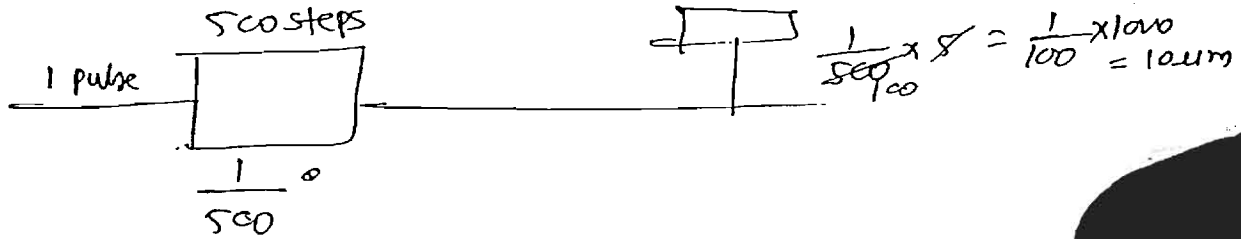
$\rightarrow$  for 600 rpm and (500 pulse for 1  $\frac{\text{rot}}{\text{min}}$ )

$$\therefore \frac{600 \times 500}{60} \text{ pulse/sec or Hz}$$

$$\text{frequency} = 5000 \text{ Hz}$$

RFS 2015

steps 500



$\therefore$  linear velocity =  $650 \times 5 = 325 \text{ m/min}$

frequency =  $\frac{650 \times 500}{60} = 5416.66 \text{ Hz (or. pulse/sec)}$

ESE 2011

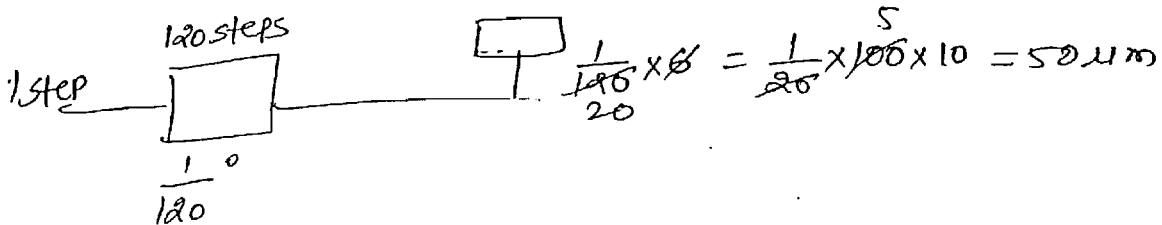
1000 pulse/sec

p = 6 mm

rpm = 500 rpm

$\therefore$  frequency =  $\frac{\text{pulse/rev} \times \text{rpm}}{60} = 1000$

$\therefore$   $\frac{\text{pulse}}{\text{rev}} = \frac{1000 \times 60}{500} = 120 \frac{\text{pulse}}{\text{rev}}$



$\therefore$  linear velocity =  $500 \times 6 = 3 \text{ m/min}$

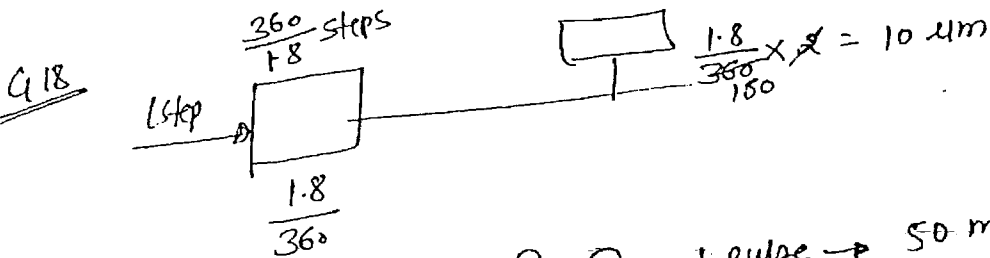
frequency = 1000 pulse/sec

प्रश्न 5

अगर answer pulse होता है तो हमें उत्तर  
गति जाना है। पहले हम BLU calculate करेंगे। Let BLU = 5mm

- 0.005 mm movement के लिए  
1 pulse भेजा। (क)
- 1 mm movement के लिए  
~~1~~  $\frac{1}{0.005}$  pulse भेजा।
- टेबल की x mm movement के  
लिए  $\frac{x}{0.005}$  pulse भेजा।
- Table velocity  $\frac{100 \text{ mm}}{\text{min}}$  movement के लिए  
feed  $\frac{100}{0.005}$  pulse/min  
=  $\frac{100}{0.005 \times 60}$  pulse/sec

4010 PC BLU = 0.005 mm, pitch = 5mm, 9mm movement  
0.005 mm के लिए 1 pulse  $\rightarrow$  9 mm के लिए  $\frac{9}{0.005} = \frac{18}{5} \times 1000$   
= 1800 pulses भेजा.



$\therefore$  0.010 mm के लिए 1 pulse  $\rightarrow$  50 mm के लिए  
 $\frac{50}{0.010}$  pulse  
= 5000 pulses भेजा  
पड़ता

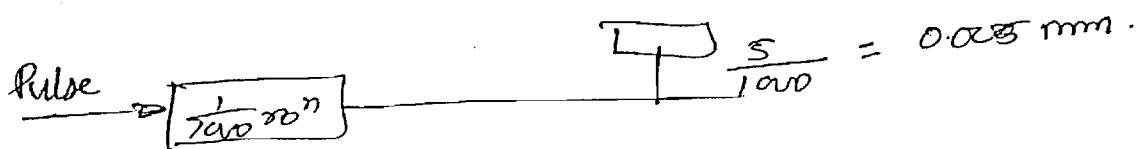
Q16

$p = 5 \text{ mm}$ , table speed =  $6 \text{ m/min}$

$\therefore \text{Steps} \times S = 6 \text{ m/min}$

$\text{rpm} = \frac{6000}{5} = 1200 \text{ rpm}$

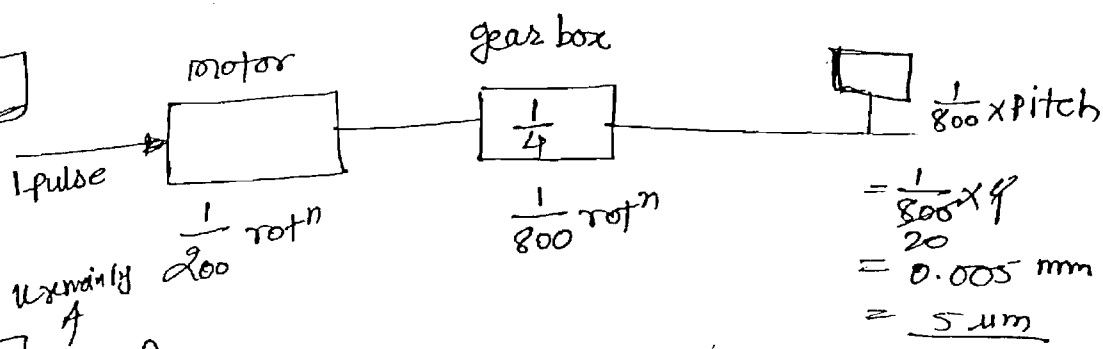
$\therefore \frac{1200 \times 5}{60} = 1000$



$\therefore 0.005 \text{ mm} \rightarrow 1 \text{ pulse}$   
 $1 \text{ mm} \rightarrow \frac{1}{0.005} \text{ pulses}$

$\therefore 6000 \text{ mm/min} \rightarrow \frac{6000}{0.005} \text{ Pulse/min}$   
 $= \frac{6000}{0.005 \times 60} \text{ pulse/sec}$   
 $= 20,000 \text{ Hz} = 20 \text{ kHz}$

Q08



$\frac{10}{73}$   $\therefore$  table velocity =  $10000 \times 5 \text{ um/min} = 50 \text{ mm/min}$

table velocity =  $10000 \times 10$   
 $= 5000 \times 10 \text{ um/min} = 50 \text{ mm/min}$