



UNIVERSITY OF VOCATIONAL TECHNOLOGY  
Faculty of Industrial & Vocational Technology

**Bachelor of Technology in Building Services Technology - 2015 / 2016(B1)**  
**Bachelor of Technology in Mechatronics Technology - 2015 / 2016 (B1)**  
**Bachelor of Technology in Manufacturing Technology -2015 / 2016 (B1)**  
Year I – Semester -I Examination - September - 2015

**Engineering Physics SM10381**

Instructions: All questions carry equal marks. Take gravitational acceleration as  $10\text{m/s}^2$

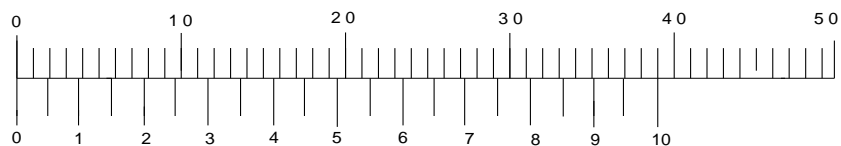
Duration : 03 hrs

1.

a.

- i. Write seven base SI units (01 marks)
- ii. What are derived units (02 marks)
- iii. Write SI units for gravitational acceleration, pressure, electric current and power (03 marks)

b. Vernier caliper has 20 divisions in the Vernier scale which coincides with 39 millimeters in main scale as given in the diagram below.



- i. Calculate the least count (05 marks)
- ii. When measuring a diameter of a rod, obtained 15 main scale divisions and 05 vernier scale divisions as the measurement. Find the diameter of the rod according to the measurement. (05 marks)
- iii. If there is a zero error of +02 vernier divisions in the vernier caliper find the corrected measurement in part (ii) above (02 marks)
- iv. What is the greatest possible error of this instrument? (02 marks)

2.

- a. A bullet is fired vertically upward with an initial velocity of  $500\text{m/s}$ . Neglecting friction, calculate
  - i. The maximum height it can reach (02 marks)
  - ii. The time taken to reach that height (02 marks)
  - iii. Instantaneous velocity at the end of 60s (02 marks)
- b. A ball is dropped from a balloon which is above 300 from the ground and rising at  $13\text{m/s}$ . For the ball find below neglecting air drag
  - i. The maximum height reached (05 marks)
  - ii. Its position and velocity 5s after being released (04 marks)
  - iii. Time taken for the ball to hit the ground (05 marks)

3.

- a. Calculate the force required to give a 20 000kg locomotive an acceleration of  $1.5\text{m/s}^2$  on a leveled track with a coefficient of friction 0.03 (08 marks)
- b. Find the tension of the connecting cord if the frictional forces on the two blocks are equal. Masses  $m_1$  and  $m_2$  are 3kg each. The force applied is 20N. Acceleration is  $0.5\text{m/s}^2$  . (12 marks)

4.

- a. A car has mass  $m$  kg and has maximum frictional force of  $7m$  Newtons between it and road. It takes a bend of 15m radius on a flat road ( $\mu=0.7$ ). How fast can the car be moving if it can take the bend successfully? (08 marks)
- b. A pilot is taking a vertical loop of 600m radius at 560km/h. Pilot weigh 80kg . What is the force does the seat press the pilot upward at the bottom of the loop (12 marks)

5.

- a. You throw a 0.150 kg baseball straight up in the air, giving it an initial upward velocity with magnitude 20.0 m/s. Use conservation of energy to find how high it goes, ignoring air resistance. (06 marks)
- b. A pendulum has a mass of 200kg ball at the end of a cable 15m long. If the pendulum is drawn back to angle of 37 degrees and released, what maximum force must the cable withstand as the pendulum swings back and forth? (14 marks)

6.

- a. A ball of mass 0.20 kg is whirled in a horizontal circle at the end of a light string 75 cm long at a speed of 3m/s. If the string is lengthened to 1.5 m while the ball is being whirled, find the speed of the ball? (05 marks)
- b. A model given in diagram fig Q (6) suspended from the ceiling of an airport terminal building consists of two metal spheres, each with mass 2.0 kg, connected by a uniform metal rod with mass 3.0 kg and length 4m. Axis of rotation is midpoint of the rod. The assembly is suspended at its midpoint by a wire and rotates in a horizontal plane, making 3.0 revolutions per minute. Find the angular momentum and kinetic energy of the assembly. [moment of inertia of a rod rotating at midpoint =  $1/12 \times \text{mass of the rod} \times (\text{length of the rod})^2$ ] (15 marks)

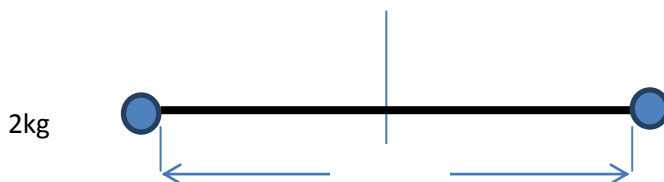


Fig. Q(6)

7.

- a. Name types of mechanical waves giving examples for each (05 marks)
- b. What are the properties of waves (05 marks)
- c. Explain Doppler effect (05 marks)
- d. What do you mean by beats? (05 marks)