

**KING FAHD UNIVERSITY OF PETROLEUM & MINERALS**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

EE 672	Satellite Communications	QUIZ # 1
Semester (062)	Section (01)	17 March, 2007

NAME :		
I.D. # :		Score : / 10

- 1) A satellite is rotating around the earth in a circular equatorial orbit. It appears above a particular earth station every 3 hours. Calculate the angular velocity of the satellite, the orbital period, and the orbital height.  
 ( $\mu = 3.9861352 \times 10^5 \text{ km}^3/\text{s}^2$ , earth radius = 6370 km) (Hint: *Kepler's third law*,  $a^3 = \frac{\mu}{\omega^2}$ )
- 2) Answer the following questions. (a question may have more than one answer)
- i. Some advantages of using satellites in the geostationary orbit are:**
    - a. Use of hand held receivers
    - b. No frequency shift due to Doppler effects
    - c. Coverage of large area on the earth
    - d. Reduction of transmission delay
    - e. Provide communications 24 hours a day
  - ii. An earth station is located in Cape town (South Africa) at longitude  $-18.42^\circ$  and latitude  $-33.92^\circ$ . In which part of the sky would you locate a satellite with a sub-satellite point longitude of  $+7^\circ$ ?**
    - a. North
    - b. North- East
    - c. East
    - d. South- East
    - e. South
    - f. South- West
    - g. West
    - h. North- West
  - iii. The angle between the orbital plane and the equatorial plane is:**
    - a. The eccentric anomaly
    - b. The true anomaly
    - c. The inclination
    - d. The right ascension of ascending node
  - iv. The use of communication satellites in highly elliptical orbits has the following advantages**
    - a. Provide 24 hour a-day communication.
    - b. Provide coverage beyond latitudes of  $\pm 76^\circ$ .
    - c. It provides relatively large bandwidth.
    - d. Small Doppler shift.
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