



**KENYATTA UNIVERSITY**  
**UNIVERSITY EXAMINATIONS 2009/2010**  
**SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF**  
**SCIENCE IN COMPUTER ENGINEERING**

**SCE 508: MODERN COMMUNICATIONS SYSTEMS**

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**DATE:** THURSDAY 8<sup>TH</sup> APRIL, 2010

**TIME:** 200P.M-400 P.M

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**INSTRUCTIONS:**

**Question ONE is compulsory**

**Answer any TWO questions from TWO, THREE, FOUR and FIVE.**

1.
  - a) What is the purpose of intermediate – frequency –splitting filters in the receive section of single – channel - per- carrier(SCPC) earth stations?  
[6 marks]
  - b) A large antenna with an effective receiving area of  $20\text{m}^2$  and a typical power gain of 1000 (30dB) detect a signal power level of  $10^{-13}\text{W}$ . What is the transmitter power needed to detect a medium- size aircraft with target area of  $10\text{m}^2$  at 200nm range? (NB  $1\text{Knot} = 1\text{nm/hr} = 0.515\text{ms}^{-1} = 1.85\text{Km hr}^{-1}$ .  
[7 marks]
  - c) In the design of fiber optic communication systems, several parameters enter into the cost- versus- performance calculations. Name these parameters.  
[ 9 marks]
  - d) Name the advantages and disadvantages of cellular system with small cells.  
[ 12 marks]
2. Name the elements of the GSM system architecture and describe their functions.  
[12 marks]
  - b) Define effective isotropic radiated power (EIRP) . Given that the transmitter output power at saturation is 33dBW and the g uplink back off

and combining losses are 7dB, find the EIRP if a 15m transmit antenna at 14GHz has a gain of 64dB. [ 8 marks]

3. a) Find the expressions for the impulse response  $h_3[n]$  and frequency response  $|H_3(\Omega)|$  of a triple MTI canceller formed by cascading three single cancellers [12 marks]
- b) Name the advantages of digital satellite communications over analog satellite communications. [8 marks]
4. a) What are the factors affecting the overall performance of a practical moving target indicator system? [10 marks]
- b) Give five advantages and five disadvantage of GEO satellite systems.
5. a) Estimate the number of propagating modes for a 1KM fibre with core and cladding indices of  $n_1=1.48$  and  $n_2= 1.46$  that has core diameters of  $50 \mu m$ . The wavelength of the optical source is  $6 \times 10^{-9} m$ . [12 marks]
- b) Give the satellite link for modulated carrier power received at the satellite receive uplink. [ 8 marks]