

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Navigation & Guidance of Aerospace Vehicles
Program: B.Tech/ASE+AVE
Time: 03 hrs.

Semester: VIII

Max. Marks: 100

Instructions: Make use of *sketches/plots* to elaborate your answer. Brief and to the point answers are expected. **The Question paper has three sections: Section A, B and C, Section B and C have internal choices.**

SECTION A

S. No.		Marks	CO
Q 1	What are the three lowest blind frequencies of the guided radar when it is operating at 10GHz with a PRF of 1.0kHz.	04	CO 1
Q 2	Determine the PRF of an MTI navigational radar operating at frequency of 10GHz if it shows the lowest blind speed of 20m/s.	04	CO 2
Q 3	Describe the salient feature of Uniform Linear Array Antenna	04	CO 3
Q 4	Explain free space and system impedance, write down the impedance of slot antenna	04	CO 3
Q 5	Define the main factors and losses which effects on most of the navigational aids and processes.	04	CO 4

SECTION B

Q 6	A radar operates at 10GHz with the transmitter power of 10kW. The radar signal is reflected from a target which is at a distance of 20km. the RCS of the target is 10m ² . The gain of the antenna is 20dBi. Calculate the received signal power.	10	CO 1
Q 7	A system produces pulses with a pulse width of 2.0microseconds. Its pulse repetition frequency if 1000/s. If the peak power of radar is 1MW, then determine the average transmitted power.	10	CO 2
Q 8	List out ten different antenna parameters used for the navigational aids for the targets placed either in airspace or on ground. What are the various polarizations used for the detection of targets and the extraction of its navigational characteristics using Synthetic Aperture Radar.	10	CO 3
Q 9	Define and explain the different symbolic nomenclatures involved in the Figure 1 which could be used for the navigation of and aircraft under point to point communications	10	CO 4

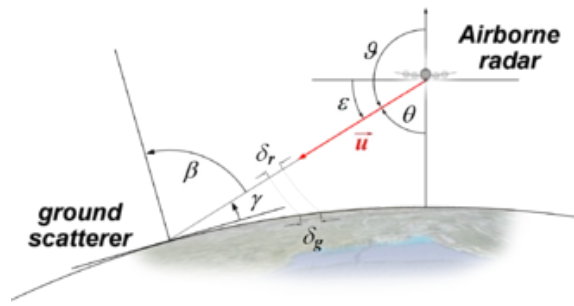


Figure 1

SECTION-C

Q 10

A navigational radar is fitted with an antenna and it has a radius of 0.5m. It has a bandwidth of 0.5MHz while operating at a frequency of 8GHz. The RCS of the target is 5.0m^2 at a maximum distance of 12km. Calculate the peak transmitted power if the noise figure is 4.77dB.

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CO 1

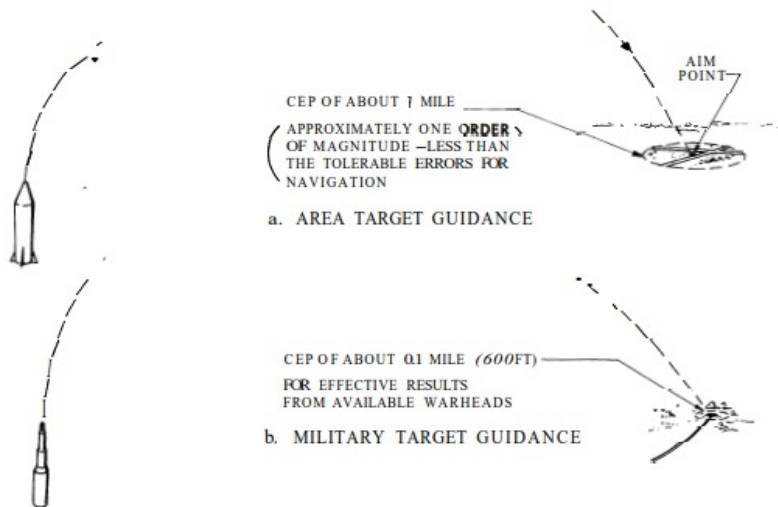
Q 11

Write the short notes on

- i) LORAN
- ii) DECCA
- iii) OMEGA
- iv) DGPS
- v) TACAN

OR

Differentiate between area and military target guidance system as shown in Figure 2.



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CO 4

Figure 2

Name:

Enrolment No:



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SECTION A

S. No.		Marks	CO
Q 1	The radar echo reaches back from a target in 50 microseconds. Find the target range.	04	CO 1
Q 2	An aircraft is moving towards a radar at 1000km/h. If a radar operates at 10Ghz, then find the Doppler shift caused by the aircraft	04	CO 2
Q 3	Describe the salient feature of Non-Uniform Linear Array Antenna	04	CO 3
Q 4	Explain the main lobe of radiation patters for the antenna systems.	04	CO 3
Q 5	Differentiate directive gain and directivity of the antenna used for the navigational purpose.	04	CO 4

SECTION B

Q 6	A CW navigational radar is illuminating towards the moving aircrafts at a frequency of 10 GHz. One aircraft with a velocity of 100m/s is approaching and another aircraft is moving away from the radar with a velocity of 200m/s. The velocity vector is making an angle of 45° with the radar axis. Find the minimum time required to resolve the aircrafts.	10	CO 1
Q 7	A radar system transmits the pulse of width 1 microsecond with PRF of 2kHz. The peak power is 1.0MW. 20 echo pulses exist in one dwell period. Find the average power, duty cycle and pulse energy and pulse energy in one dwell period.	10	CO 2
Q 8	List out ten different antenna parameters used for the navigational aids for the targets placed either in airspace or on ground. What are the various polarizations used for the detection of targets and the extraction of its navigational characteristics using Synthetic Aperture Radar.	10	CO 3
Q 9	A parabolic reflector operates at a frequency of 9GHz and it provides a power gain of 100dB. Find out the capture area and beam width of the parabolic reflector.	10	CO 4

SECTION-C

Q 10	A navigational radar is fitted with an antenna and it has a radius of 0.5m. It has a bandwidth of 0.5MHz while operating at a frequency of 8GHz. The RCS of the	20	CO 1
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target is 5.0m^2 at a maximum distance of 12km. Calculate the peak transmitted power if the noise figure is 4.77dB.

Q 11 Write the short notes on

- i) GPS
- ii) MDS
- iii) ILS
- iv) DGPS
- v) FMS

OR

Differentiate between area and military target guidance system as shown in Figure 1.

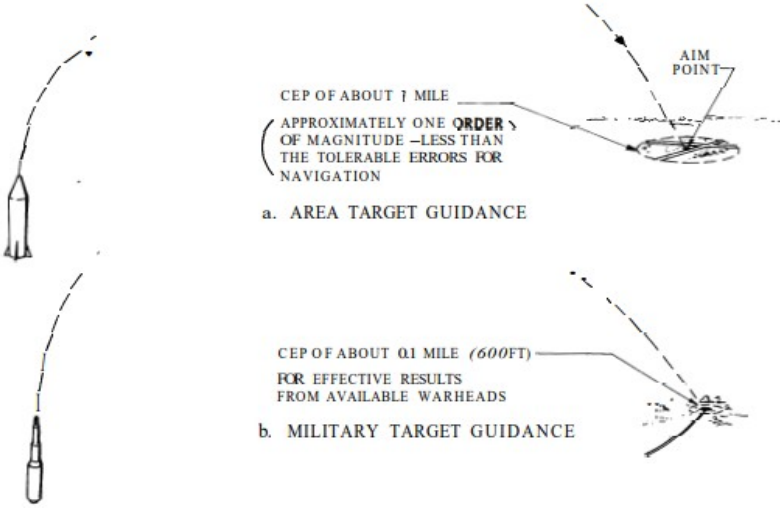


Figure 1

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CO 4