

# CBCS SCHEME

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17AE/AS754

## Seventh Semester B.E. Degree Examination, July/August 2021 Guidance, Navigation and Control

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions.*

1. a. Define the terms: (i) Navigation (ii) Guidance (iii) Control. Explain the concept of each. Also explain different types of navigation. (10 Marks)  
b. Explain the basic principle of RADAR with a neat sketch. (10 Marks)
2. a. Derive RADAR Range Equation. Mention its uses. (10 Marks)  
b. Positions of two aircrafts 'A' and 'B' are shown in Fig.Q2(b). Aircraft A has a speed of 800 m/s and carries CW RADAR transmitting at 400 MHz frequency and tracking aircraft 'B' which as speed of 1000 m/s. Calculate:  
(i) The Doppler frequency shift recorded by RADAR in aircraft 'A'.  
(ii) Is this shift positive or negative?  
(iii) What should be the flight direction of aircraft 'B' for frequency shift to be zero?

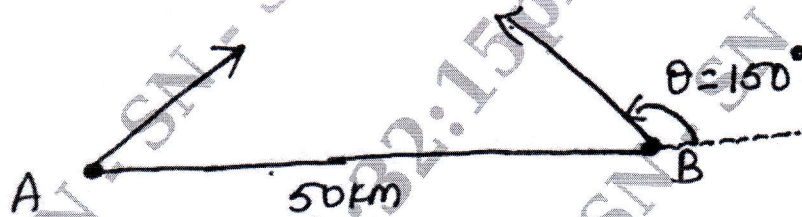


Fig.Q2(b)

(10 Marks)

3. a. Explain the principle of tracking with respect to RADAR, with a neat block diagram. Also mention the parameters of tracking. (10 Marks)  
b. Explain the following tracking techniques:  
(i) Sequential Lobbing  
(ii) Conical scanning (10 Marks)
4. a. Explain the following:  
(i) Inertial Navigation and Inertial Guidance  
(ii) Laser Based Guidance (10 Marks)  
b. Briefly explain the principle of Global Positioning System (GPS) along with its various segments. Mention its advantages and disadvantages. (10 Marks)
5. a. Define transfer function. Obtain the input-output transfer function of open-loop and closed loop control system. (10 Marks)  
b. List out the differences between open-loop and closed loop control system. (10 Marks)
6. a. Describe the need of roll stabilization in Missiles with a neat block diagram. (10 Marks)  
b. Explain the operation of Missile Autopilot with a neat schematic. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 7 a. Explain the following guidance laws:  
(i) Command guidance  
(ii) Homing Guidance and its types (16 Marks)
- b. Define the following terms with respect to Missile Guidance:  
(i) Closing velocity  
(ii) Miss Distance  
(iii) Blind zone  
(iv) LOS rate (04 Marks)
- 8 a. Define a guidance law. Explain the different guidance phases of SAM and AAM. (10 Marks)
- b. Explain the following guidance concepts with respect to missiles:  
(i) PN guidance Law  
(ii) Pursuit Guidance (10 Marks)
- 9 a. Describe the Integrated Flight/Five control system (IFFC) and explain various components associated with it. (10 Marks)
- b. Explain the Tracking Control Laws (TCL) with respect to IFFC. (10 Marks)
- 10 a. Explain the working principle of Director fire control system with a neat diagram. (10 Marks)
- b. Explain the principle and operation of Pitch Orientational Control System (POCS) with a neat schematic. (10 Marks)

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