EEEN 462 – ANALOGUE COMMUNICATION

INSTRUMENT LANDING SYSTEM (ILS)– STUDY GUIDE

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1. **ILS provides precision guidance for aircraft in: .....**
   a) En-route navigation
   b) Approach and landing
   c) Taxiing
   d) Take-off
2. **The lateral guidance component of ILS is the .....**
   a) Glide Path (GP)
   b) Localizer (LOC)
   c) Marker Beacons
   d) DME
3. **Localizer operates in which frequency band?**
   a) 108.10–111.95 MHz
   b) 329.15–335.00 MHz
   c) 75 MHz
   d) 960–1215 MHz
4. **Glide Path provides .....**
   a) Azimuth guidance
   b) Vertical guidance
   c) Range information
   d) Speed calibration
5. **The standard ILS glide slope angle is .....**
   a) 1°
   b) 3°
   c) 5°
   d) 10°

6. **The modulation scheme for ILS localizer signals is .....**

   a) DSB-SC with 90 Hz and 150 Hz tones

   b) FM with 90 Hz and 150 Hz tones

   c) AM with 90 Hz and 150 Hz tones

   d) PCM

7. **Difference in Depth of Modulation (DDM) determines .....**

   a) Aircraft altitude

   b) Deviation from centerline/glide path

   c) Signal strength

   d) Frequency stability

8. **A DDM of 0 indicates the aircraft is .....**

   a) Left of course

   b) Right of course

   c) On course

   d) Above glide path

9. **Glide Path transmitters operate in the .....**

   a) VHF band (108–112 MHz)

   b) UHF band (329–335 MHz)

   c) L-band (960–1215 MHz)

   d) C-band (5 GHz)

10. **Outer Marker (OM) typically indicates .....**

    a) Decision height (CAT I)

    b) Final approach fix

    c) Runway threshold

    d) Missed approach point

11. **Middle Marker (MM) flashes .....**

    a) Blue lights

    b) Amber lights

    c) White lights

    d) Green lights

12. **The critical area for ILS localizer must be kept clear of vehicles/aircraft to prevent .....**

    a) Frequency interference

b) Multipath distortion

c) Signal reflections

d) All of the above

13. **ILS Category IIIc allows landing with .....**

a) 200 ft decision height

b) 100 ft decision height

c) No decision height / zero visibility

d) Daylight only

14. **ILS localizer and glide path frequencies are .....**

a) Independently selected

b) Paired (selection of one auto-tunes the other)

c) Always fixed for a runway

d) UHF-only

15. **The "clearance" signal in ILS .....**

a) Indicates optimal approach path

b) Provides margin before false course signals

c) Clears ATC communication

d) Activates at 10 nm range

16. **ILS monitor systems trigger alarms if DDM exceeds .....**

a) 0.001

b) 0.015

c) 0.075

d) 0.500

17. **Multipath errors in ILS are caused by .....**

a) Atmospheric refraction

b) Signal reflections from terrain/vehicles

c) Transmitter power fluctuations

d) Receiver thermal noise

18. **The "course line" width for localizer at runway threshold is typically .....**

a) ±0.5°

b) ±1.5°

c) ±5°

d) ±10°

19. **Aircraft ILS receivers use _____ to reject false courses.**
    a) Frequency diversity
    b) Spatial filtering
    c) CSB/SBO signal processing
    d) Doppler correction
20. **ILS is being supplemented/replaced by .....**
    a) VOR
    b) GBAS (GLS)
    c) NDB
    d) Radar

TRUE/FALSE QUESTIONS

21. ILS glide path antennas are located at the runway threshold.
22. Localizer signals provide vertical guidance to aircraft.
23. Marker beacons transmit modulated 75 MHz signals.
24. ILS requires line-of-sight between ground equipment and aircraft.
25. ILS Category I requires a decision height of 200 feet.

SHORT ANSWER QUESTIONS

26. **Explain how the localizer generates left/right deviation signals using CSB and SBO signals.**
27. **Describe the "capture effect" in glide path reception and its safety implications.**
28. **Why is site preparation critical for ILS installation? Mention two key requirements.**
29. **Calculate the DDM for a localizer with 18% 90 Hz modulation and 12% 150 Hz modulation.**
30. **Compare ILS with Microwave Landing System (MLS) in terms of frequency bands and advantages.**

MODEL ANSWERS

MULTIPLE CHOICE QUESTIONS

1. b
2. b
3. a
4. b
5. b
6. a
7. b
8. c
9. b
10. a
11. b
12. d
13. c
14. b
15. b
16. b
17. b
18. a
19. c
20. b

TRUE/FALSE QUESTIONS

21. F (Located 300m beyond runway end)
22. F (Localizer = lateral, GP = vertical)
23. T
24. T

25. T

SHORT ANSWERS QUESTIONS

26. **CSB/SBO processing:**

- **CSB (Carrier + Sidebands)**: Transmits both 90 Hz and 150 Hz.
- **SBO (Sideband Only)**: Directional antennas transmit 90 Hz/150 Hz in opposite phases.
- **DDM calculation**: DDM=%90Hz−%150Hz%90Hz+%150HzDDM=%90Hz+%150Hz %90Hz−%150Hz. Aircraft compares amplitudes to determine deviation.

27. **Capture effect & safety:**

- Stronger glide path signals may "capture" receiver even if off-course.
- **Safety risk**: Aircraft could follow false glide path below safe altitude. Mitigated by monitor systems and site surveys.

28. **Site preparation requirements:**

- **Critical/sensitive areas**: Must be free of reflective objects (vehicles, buildings).
- **Terrain grading**: Flat approach/takeoff zones (±1° slope).
- **EMI protection**: Shield from high-power transmitters.

29. **DDM calculation:**

DDM=18%−12%18%+12%=630=0.2DDM=18%+12%18%−12%=306=0.2

(Note: Actual alert threshold is 0.015–0.18 DDM)

30. **ILS vs. MLS:**

Feature	**ILS**	**MLS**
Frequency	VHF/UHF	C-band (5 GHz)
Coverage	Fixed path	Flexible curved paths
Accuracy	±0.5°	±0.1°
Multipath	Sensitive	Resistant
Capacity	1 aircraft/runway	Multiple aircraft