

**GEOGRAPHIC INFORMATION SYSTEMS  
GEOGRAPHIC INFORMATION CENTER  
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**\*\*\* EXAMINATION \*\*\***

**ACOUSTIC MULTIBEAM SURVEY SYSTEMS FOR DEEP-DRAFT NAVIGATION PROJECTS**

1. **Multi-beam swath survey technology was developed in the**
  - a) early 1960's by the United States Army Corp of Engineers
  - b) early 1960's by the Coast Guard
  - c) early 1960's by the US Navy
  - d) None of the above
  
2. **Interferometric acoustic detection is also known as:**
  - a) phased array
  - b) multi-path
  - c) streaming
  - d) profiling
  
3. **Each array pulse can map an area:**
  - a) 1/2 the channel depth
  - b) the same area as the channel depth
  - c) 2 to 14 times the channel depth
  - d) None of the above
  
4. **Multibeam systems can obtain:**
  - a) 80% bottom coverage
  - b) 90% bottom coverage
  - c) 95% bottom coverage
  - d) 100% bottom coverage
  
5. **An underwater topographic mapping feature of a multi-beam system is:**
  - a) constricted channels
  - b) lock chambers
  - c) revetments
  - d) All of the above
  
6. **Multi-beam system frequencies may be adjusted to collect:**
  - a) dredging measurements
  - b) strike detection
  - c) structure mapping
  - d) All of the above

7. **Usually multi-beam systems can produce final drawings:**
  - a) the same day the survey was performed
  - b) the next day after the survey was performed
  - c) within two days after the survey was performed
  - d) within three days after the survey was performed
8. **The multi-beam transducers are typically based on:**
  - a) cross-section geometry
  - b) cross-fan geometry
  - c) spherical geometry
  - d) geodetic geometry
9. **Each transmission of the array is called:**
  - a) a shot
  - b) a sounding
  - c) a ping
  - d) None of the above
10. **Beam spacing for swath systems are:**
  - a) 0.5 to 3.0 degrees
  - b) 3.0 to 4.5 degrees
  - c) 4.5 to 6.0 degrees
  - d) 6.0 to 8.5 degrees
11. **The signal parameters of an echo signal depends on:**
  - a) the depth
  - b) the temperature
  - c) the bottom reflectivity
  - d) All of the above
12. **A multi-beam sonar's bottom detection provides the:**
  - a) an estimate of the amount of silt
  - b) the round-trip travel time of the acoustic pulse
  - c) the current tide reading
  - d) None of the above
13. **The most prevalent error of multi-beam systems is:**
  - a) beam spreading
  - b) low depths
  - c) slow vessel speed
  - d) high water temperature
14. **A type of beamforming method is:**
  - a) electronic
  - b) physical
  - c) phased array
  - d) All of the above

15. **An advantage of physical beamforming is:**
- a) low high signal-to-noise ratio
  - b) high side lobe interference
  - c) less expense
  - d) high percentage of 'bad' data points
16. **A phase array method advantage over electronic beamforming is:**
- a) outer beam detection is more robust and stable
  - b) shallow water data acquisition is easier
  - c) irregular bottom data is easily acquired
  - d) None of the above
17. **A disadvantage of the phase array system is:**
- a) data acquisition is slow
  - b) resolution depends on the internal detection rate
  - c) data acquisition is too fast
  - d) None of the above
18. **Equal beam spacing means:**
- a) the angle between the beams is equal
  - b) the distances between the beams at the vessel are equal
  - c) the distances between the beams at the bottom are equal
  - d) None of the above
19. **Equal footprint spacing means:**
- a) the angle between the beams is equal
  - b) the distances between the beams at the vessel are equal
  - c) the distances between the beams at the bottom are equal
  - d) None of the above
20. **Amplitude imagery is also called:**
- a) backscatter intensity
  - b) angle independent imagery
  - c) time series imagery
  - d) LIDAR imagery
21. **Angle independent imagery is also called:**
- a) LIDAR imagery
  - b) time series imagery
  - c) backscatter intensity
  - d) false target imagery
22. **Survey lines for multi-beam systems are run:**
- a) longitudinal with the channel alignment
  - b) normal to the channel alignment
  - c) along the toe of each slope
  - d) normal or longitudinal depending on the depth

23. **A disadvantage of a multi-beam system is:**
- a) increased editing
  - b) increased post processing time
  - c) increased need for more sophisticated computer hardware
  - d) All of the above
24. **Multi-beam swath survey systems are recommended for:**
- a) pre-dredge surveys
  - b) post-dredge surveys
  - c) dredging measurement
  - d) All of the above
25. **Multi-beam sensors can be configured to detail:**
- a) pipelines
  - b) bulkheads
  - c) flood walls
  - d) All of the above
26. **DTM means:**
- a) digital terrain model
  - b) data test model
  - c) degree of test measurement
  - d) None of the above
27. **DEM means:**
- a) data elevation mode
  - b) digital extended mode
  - c) digital elevation model
  - d) None of the above
28. **Multi-beam system operator training is available:**
- a) from NSPS
  - b) from the Hydrographic Society of America
  - c) from the University of New Orleans
  - d) from Tulane
29. **Pitch, roll, and yaw must sense angular changes to the nearest:**
- a) 0.1 degree
  - b) 0.6 degree
  - c) 0.9 degree
  - d) 1.2 degree
30. **A characteristic of inadequate refraction correction is:**
- a) flat profiles
  - b) flat cross-sections
  - c) the 'smile' or 'frown' of a multi-beam profile
  - d) All of the above

31. **System latency calibrations will check time variances between:**
- a) positioning
  - b) depth
  - c) motion sensors
  - d) All of the above
32. **A type of offset measurement to be checked is:**
- a) DGPS antenna offsets
  - b) static and dynamic drafts
  - c) vessel squat
  - d) All of the above
33. **Velocity calibrations shall be performed at least:**
- a) once per day
  - b) twice per day
  - c) twice per week
  - d) four times per month
34. **Performance data reduction:**
- a) should be performed in near real-time
  - b) should be performed on different projects
  - c) should be performed on different topography
  - d) None of the above
35. **Greater control and calibration can be accomplished by:**
- a) high accuracy differential GPS
  - b) a heave-pitch-roll sensor
  - c) a gyrocompass
  - d) All of the above
36. **The initial installation alignment is performed with the vessel:**
- a) in deep water
  - b) in shallow water
  - c) on a trailer or on blocks
  - d) None of the above
37. **The center of the sensor can be found:**
- a) using a gyrocompass
  - b) in the manufacturer's schematics
  - c) using a motion detector
  - d) None of the above
38. **The azimuth misalignment of the HPR will result:**
- a) in depth measurement errors proportional to the water depth
  - b) in yaw errors
  - c) in roll errors
  - d) in pitch errors

39. **A gyro should be aligned with:**
- a) the y-axis of the vessel
  - b) the x-axis of the vessel
  - c) both a and b
  - d) None of the above
40. **The patch test determines:**
- a) residual pitch and roll offsets
  - b) residual positioning time delay
  - c) residual yaw offset
  - d) All of the above
41. **Roll bias will best show up in:**
- a) rough water
  - b) shallow water
  - c) deep water
  - d) All of the above
42. **If the along-track displacement increases and boat speed remains the same,**
- a) the latency will increase
  - b) the latency will decrease
  - c) the latency will remain the same
  - d) the test should be repeated
43. **If the difference in the vessel speeds increase during latency tests,**
- a) the time delay will increase
  - b) the time delay will decrease
  - c) the time delay will not be affected
  - d) None of the above
44. **During pitch offset bias tests,**
- a) the deeper the water the larger the offset
  - b) the deeper the water the smaller the offset
  - c) deeper water will have no effect
  - d) None of the above
45. **Data filtering and editing can be done in:**
- a) real-time
  - b) post-processing
  - c) both a and b
  - d) None of the above
46. **Visual editing of spikes can be done by:**
- a) viewing a 3-D model
  - b) viewing a single profile
  - c) thinning data
  - d) All of the above

47. **In navigation projects a:**
- a) 20% side overlap is recommended
  - b) 35% side overlap is recommended
  - c) 50% side overlap is recommended
  - d) 70% side overlap is recommended
48. **A 50% side overlap will give a:**
- a) 50% bottom coverage
  - b) 100% bottom coverage
  - c) 150% bottom coverage
  - d) 200% bottom coverage
49. **Beam angles for strike detection work should not exceed:**
- a) 45%
  - b) 90%
  - c) 135%
  - d) 180%
50. **Maximum survey speed for hard bottom navigation surveys is:**
- a) 2-5 knots
  - b) 5-10 knots
  - c) 10-15 knots
  - d) unlimited
51. **Maximum survey speed for soft bottom navigation surveys is:**
- a) 2-5 knots
  - b) 5-10 knots
  - c) 10-15 knots
  - d) unlimited
52. **Acoustic frequency for hard bottom navigation surveys is:**
- a) 80 kHz
  - b) 140 kHz
  - c) 200 kHz
  - d) 240 kHz
53. **Velocity probe calibrations should be located:**
- a) at the project site for hard bottom navigation surveys
  - b) near the project site for hard bottom navigation surveys
  - c) either a or b
  - d) None of the above
54. **The corrective action for an inconclusive gyro test is:**
- a) remount
  - b) move
  - c) replace
  - d) Any of the above

55. **The corrective action for an inconclusive GPS antenna test is:**

- a) remount
- b) move
- c) replace
- d) Any of the above

56. **The calibration of a transducer is done by:**

- a) steel tape
- b) gyro
- c) total station
- d) All of the above

57. **The allowable tolerance of squat is:**

- a) 0.1 foot
- b) 0.3 foot
- c) 0.5 foot
- d) 0.7 foot

58. **The allowable tolerance of pitch is:**

- a) 0.1 foot
- b) 0.2 foot
- c) 0.3 foot
- d) 0.4 foot

59. **The allowable tolerance of roll is:**

- a) 0.1 foot
- b) 0.2 foot
- c) 0.3 foot
- d) 0.4 foot

60. **The allowable tolerance of yaw is:**

- a) 0.1 foot
- b) 0.2 foot
- c) 0.3 foot
- d) 0.4 foot

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I hereby certify that I studied the course materials, and the above answers are my own. No other person has helped me to complete this exam.

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