

Marine Engineering Exam Resource – Review of Shafts, Keys, Hubs, And Fits - Fans And Blowers

1. What two major stresses are shafting subjected to?  
Twisting and bending. Page 66.
2. Turning a shaft on a lathe with the headstock “out of true” will result in the shaft being?  
Excentric.
3. What chuck would you use to turn a seat for a spherical roller bearing on a repaired shaft?  
Four jaw independent - more accurate - dial indicate.’
4. Coefficient of expansion with shafting is .000006. What will be the expansion in a ten-foot length of shafting with a 50 degree F temperature rise?  
Page 79. Expansion of steel coefficient is .000006  
Expansion = coefficient of expansion X length (in inches) X temperature rise  
 $E = C \times L \times T$   
.036 = .000006 x 120 x 50degrees F.
5. What are keys used for?  
Positive Drive.
6. What are two basic shapes of keys?  
Rectangular and Woodruff page 67.
7. What is a parallel key?  
All sides are parallel.
8. What is a Pratt and Whitney key?  
Parallel key with a round end.
9. What is a taper key?  
Top surface is tapered. Taper 1/8” in 12”. Page 67.
10. What is a gib key?  
Tapered or straight - straight where gear must be taken off frequent used with cast iron hub - gib for easy extraction. Page 67.
11. What is the taper on a taper key?  
1/8” per foot - 1” in 96” page 68.
12. What is a feather key?  
Key held in with two setscrews. - So key does not come out. - Possible where gears are sliding.

13. What is a dutchman?  
Spacer used to knock out key. Page 73.
14. What is a saddle key?  
Emergency key ground to fit shaft. - Compression fit. - No key seat. - Just fit on shaft. - Light duty drive fan. Page 72.
15. What type of drives would you use a saddle key?  
For fan. - Something running in one direction only.
16. What type of key would you use if the size in the hub and shaft were different. ?  
Step key. Largest size that fits hub. - Smallest size that fits shaft.
17. General rules for fitting a key are?  
Tight on sides. Maximum clearance of .002 on top. Key size - roughly  $\frac{1}{4}$  size of shaft. 1" shaft  $\frac{1}{4}$ " key up to  $\frac{1}{2}$ " key.
18. What type of key needs no other assist to hold a hub?  
Taper key.
19. What size should set screws be when holding a hub on a key?  
Same width as keyway up to  $\frac{1}{2}$ ". Page 77.
20. What type of key should be used with a taper lock bushing?  
Parallel key. Square key. Flat key.
21. What type of key would you use to secure a 8" cast iron pulley to a steel shaft?  
Straight or parallel key with set screws. Cast iron may break with taper key.
22. Draw a diagram of a setscrew placement in a hub for the best holding power.  
90 degrees to each other. Same distance from hub end. Page 72.
23. What does the number 608 represent?  
Woodruff key size. First two digits in  $\frac{1}{32}$  second two digits in  $\frac{1}{8}$ .  
 $\frac{6}{32} \times \frac{8}{8} = \frac{3}{16}$  wide X 1" long  
Common one is 1212 =  $\frac{12}{32} \times \frac{12}{8} = \frac{3}{8} \times 1 \frac{1}{2}$ ".
24. What kind of chisel could be used to cut a keyway?  
A cape chisel. Page 74.
25. Keys in taper lock bushings should be tight and where?  
Tight on all sides.

26. What is an interference fit?  
Requires force to fit. - Press or shrink fit. - Hole diameter is equal to or less than shaft diameter. Page 78.
27. A hub that is frequently removed from a shaft will have what kind of fit?  
Sliding fit. - One piece slightly large. - Clearance fit. Page 78.
28. What are some methods of shrink fits?  
Freeze - in freezer, dry ice. Heat - bearing in hot oil bath, fluid bath, Induction heater.
29. What are some cautions that you must be concerned with when using shrink fit methods?  
Be careful in direct heat, - protect heat treating of metal. Use soft punch, brass. Keep parts clean and free from grit and keep smooth. Page 79.
30. What is ambient temperature?  
Room temperature. Temperature of surrounding air.
31. How much expansion will a bore 3" have when heated to 480 degrees F?  
Steel coupling, room temperature 70 degrees  
 $E = C \times L \times (T \text{ rise} - \text{Ambient Temperature})$   
 $E = .000006 \times 3" \times (480 - 70)$   
 $E = .00738$   
Therefore expansion of .007.
32. Why do unbalanced draft fans require much more maintenance than other fans?  
Because of corrosive or wearing effect of fly ash in flue gases. Furnace room,  
Balanced - one fan blowing in, one fan sucking out.  
Unbalanced - one fan suck in out.
33. Balanced draft systems ensure that the pressure in the furnace over the fuel is maintained...  
a. At constant or atmospheric pressure  
b. Fans at both sides of room same C. F. displacement.
34. Critical speed of a rotating element is the speed :  
Is speed where instability and vibration occurs and causes its destruction.
35. Why are mechanical draft fans used in industrial heating in power plants?  
To obtain an air flow or draft independent of building temperature.
36. Explain a propeller type fan.

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Large propeller mounted in housing with airflow straight through or parallel to shaft axis. Used to move large volume of air at low pressure.

37. Explain an axial fan.

Movement of air parallel to the axis.

38. What are the two types of axial fans?

Tube Axial - flow straight through. Direct Vane Axial - to prevent turbulence, stationary blade behind fan to help stop turbulence.

39. Explain a centrifugal fan.

Air enters center of fan where it is pushed to the outside by centrifugal force. It exits at 90 degrees to shaft axis. Squirrel cage fan.

40. How is the amount of air moved by a fan measured?

Cubic feet per minute. - C.F./M.

41. What is static pressure?

Pressure of the fan developed to move air along, measured by inches on water gage. Resistance along side of inside of air duct.

42. Explain the different types of drafts used for ventilation.

Forced Draft - pushing air into room

Induced Draft - suck air out of room. (Paint room)

Forced Induced Balanced - fan in each end of room.