

Marine Engineering Exam Resource – Review of Couplings

1. What are rigid couplings used for?
Used to join drive shafts together. True alignment and rigidity are required. Example Drive shafts and production lines, bridge cranes, solid shaft that needs to be split. Page 143.
2. Where are flanged couplings used?
A type of rigidity coupling used to join shafts of the same or different diameter. Keys are required.
3. What are compression couplings used on?
Used to join shafts of equal diameter, they do not require a key. The flanges are tapered bore for a compression fit by a tapered sleeve onto the shaft only used for light single direction loads. Page 144
4. What is the advantage of flexible couplings?
They allow for minor misalignment, minor end float and minor changes in shaft position due to thermal expansion or contraction. Page 145
5. What are slider couplings used for?
Low speed. High torque conditions. Page 145
6. What is a chain coupling?
Consists of two sprocket hubs, which are connected by a length of roller chain to supply the drive from one shaft to another. Page 145
7. What is a falk coupling? (grid flex)
Two slotted hubs that are joined by a spring steel grid to supply the drive from one shaft to the other. Page 147.
8. What is the most important aspect of coupling installation?
Alignment in all directions.
9. What are spacer couplings used for?
Spacer couplings allow the center segment of the coupling to be removed. So maintenance can be carried out without disturbing the drive or adjustment. Page 152.
10. What is a floating shaft coupling?
Basically the same as a spacer coupling, except the distance between the coupling halves is much greater with the coupling on each end of the shaft used where drive is transferred through wall or bulkhead.
11. What is the advantage of a fluid coupling?
No physical contact between halves. Allows motor to rev up before load is engaged. Prevents stalling or damage to the motor if a “jam up” or “seizure occurs”. Page 153.
12. What are the basic conditions for coupling misalignment?
Angular. Offset. Page 155.

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13. What checks should be made before aligning a coupling?
Check bedplate. Anchor bolts are tight. Pump and gearbox are firmly bolted down. All connections are made. Example Piping, bearings, are in good condition. No bent shafts. Motor pads are clean from burrs and paint. No rock in motor, (soft pads). Page 156.
14. What methods can be used for coupling alignment?
Straight edge. Feeler gauges. Calipers. These can be used for rough alignments. Precision alignments you should use a dial indicator. Page 157
15. What is the most accurate alignment method?
Dial indicator method. Page 158-159.
16. What is the sequence of alignment procedures?
 - A) vertical angular
 - b) vertical parallel
 - c) horizontal angular
 - d) Horizontal parallel Page 156.
17. What are the shimming formulas used in coupling alignment?
$$\text{Shims required} = \frac{\text{Distance between holes}}{\text{Diameter of area being wiped}} \times (\text{Diameter of face of coupler}) \times \text{total indicator reading.}$$
18. Where would misalignment be put into a coupling?
If one unit runs hotter than the other, then the hotter unit is set lower than the cold unit so coupling alignment is achieved at operating temperature. Page 155
19. What three groups are clutches classified in?
 - A) Mechanical - Positive contact, friction type, over running, one way.
 - B) Hydraulic or pneumatic
 - C) electrical Page 165 -166
20. What are jaw clutches used for?
Positive contact. No slippage.
21. When should friction plates be changes in a friction clutch?
Before the rivets show signs of wear or before excessive wear takes place with the molded type.
22. What is the advantage of a torque converter over a fluid coupling?
Better efficiency. Ability to multiply torque. Can be back feed torque.
23. What types of coupling are used to join two shafts that meet at an angle?
Universal joints
24. A heavily loaded drive has to be repeatedly started, motor overload is reduced by using what type of coupling?
Centrifugal coupling / clutch or fluid coupling. Page 154 – 155

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25. A V belt has a number C 45, explain what these numbers mean?
C = cross section of belt (A, B, C, D, E). 45 = the nominal length on pitch line (inches or millimeters.) 50 = match code Page 174 - 176 - 177
C 45 49 49 = 1/10 undersized
C 45 51 51 = 1/10 oversized
26. A V belt idler should be used where?
Outside - inside Drive side - slack side
Inside idler decreases area of contact. Outside idler increases area of contact. Page 181.
27. What determines grip of a belt?
Belt tension. Wrap around the sheave. Sheave condition. (Coefficient of friction)
28. The neutral axis or pitch line of a V belt is?
Where the drive or tension members are usually located. Page 174.
29. If the bottom of the V groove in a pulley is "shiny" what does this indicate?
The sleeve is worn and the belt is riding on the bottom of the groove. Pulley groove is worn.
Page 186
30. The type of belt that would be used where slippage cannot be tolerated is?
Timing or positives drive belt. Page 186 –190
31. Where would a link belt be used?
Used where it is impossible to use a endless type V belt. In an emergency where the correct belt is not available. Page 183
32. Standard crown of a flat belt pulley is?
1/8" in 12 in" 1" in 96" Page 195 – 196
33. Compass belts are designed to run what type of pulley?
Flat belt pulleys. Page 194
34. On a flat belt drive with various pulley widths, the belt width is determined by?
The narrowest pulley. Up to 6" - 1" either side. Over 6" - 2" either side. Page 195
35. The purpose on a crown on a pulley is to?
Keep the belt on track. Page 195
36. A rolled edge flat belt with one layer of cords is known as?
Compass belt. Page 194
37. With a V belt marked E 330, the 330 stands for what?
E = cross section 330 = the length of pitch line.
38. How are flat belts joined?
Mechanical fasteners, a) alligator, b) bulldog, c) hinged

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Splicing / vulcanizing. Page 196 – 197

39. What is the most important dimension on a chain?
Pitch
40. Explain a #80 chain?
8 - is pitch in 1/8 of an inch
0 - regular chain- usual proportion
5 - roller less
1 - light weight.
41. What is a type A sprocket?
Type A = steel plate sprocket no hubs
Type B = hubs on one side
Type C = Hubs on both sides
Type D = Split hub Page 237 – 238.
42. Explain the marking 40-120-2 on a chain sprocket?
40 - chain size. 4- pitch in 1/8 of an inch, 0- regular chain. 120- number of teeth. 2- double stranded chain.
43. What type of link joins two chain ends?
Connecting links.
44. What is #45 chain?
4 - $4/8 = \frac{1}{2}$ " pitch
5 - rollerless
45. Wear on the sides of sprocket teeth and the inside surface of roller link plate indicates?
Mis-alignment.
46. How do we lengthen or shorten a chain by one pitch?
By an offset link. Page 236
47. A high-speed drive with a single chain needs frequent changes of and sprockets. How can we eliminate this problem?
Use a double chain with a smaller pitch. Stronger and more flexible. Page 242
48. A roller chain will have longer service life with?
Lubrication oil. Correct alignment. Correct tension.
49. What is a herringbone gear?
Double helical gears cut together. No thrust. Smooth operation. Page 216
50. What is a worm gear?
Worm gear resembles a screw with threads. Smooth operations. Used in speed reducers. 30 % power loss. FL. A. oil required. Page 217

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51. What is a hypoid gear?
A form of a helical gear for transmitting power with crossing shafts. E P oil required. Page 219
52. How is the ratio of a gearbox calculated?
Input as compared to output. 25 RPM in 1 RPM out = 25:1
53. How is the ratio of a worm gear box calculated?
Number of teeth on worm gear divided by number of starts on the worm.
54. What is diametral pitch?
The number of teeth on a gear, for every inch of pitch diameter. Example 30 teeth with 3 inch pitch diameter = DP = 10. Gear must have same DP to mesh. Page 212-213.
55. What gear set gives a reciprocating motion?
Rack and pinion. Page 214.
56. Gears operating on crossing shafts are?
Hypoid gears. Page 219.
57. How do we prevent rotation of a shaft-mounted gearbox?
Holding the housing with a tie rod. Page 231.
58. What is the reduction of a worm gear box that has a 60-tooth worm gear and a single start worm?
Number of teeth in worm gear divided by number of start in worm = 60:1.
59. Gears that intersect and have an equal number of teeth are?
Mitre gears. 45 degree angle both same. Bevel gear can have two different angles. Page 217.
60. What combination should helical gears be if they are to operate on parallel shafts?
Opposite hand. Right hand and left hand. Page 215.
61. What type of gearing does not require thrust bearings?
Herringbone. Spur gear. Double helical. Two separate gears back to back left and right hand. Page 216-214.
62. Which direction can a motor turn in an overrunning clutch?
One direction only. Conveyors.
63. When is a dial indicator reading most accurate?
When the plunger is 90 degrees to the surface of the coupling.

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Overrunning or one way clutches

Indexing is achieved by every forward stroke of the rack - return stroke clutch will free wheel.

Roller-ramp Over running clutch

Clutch will allow drive in one direction only

SPRAG / CAM UNIT

The principal of operation in both roller and sprag / cam units is the same. If the input and the output elements try to turn so the rollers or sprag / cams jam between them, the unit will lockup. If the input and output elements turn so the rollers or sprag / cams push out of the way, the unit will disengage.

APPLICATIONS

One-way positive engagement clutches and brakes are used in many kinds of equipment:

As a backstop or holdback brake on an elevator or conveyer to prevent downward motion in case power fails.

As an overrunning or freewheeling clutch to allow the output to turn faster than the input. A bicycle drive is an example; the rider can stop pedaling while the bike coasts.

As an auxiliary or inspection drive that allows two or more power sources to turn the same equipment independently. If one motor stops, its clutch freewheels while the load is driven by another power source.