CERTIFICATES OF COMPETENCY FOR ENGINEERS (YACHT)

EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF THE
MARITIME AND COASTGUARD AGENCY

STCW 95 CHIEF ENGINEER (REG. III/3) – "YACHT 4"

056-02 AUXILIARY EQUIPMENT

FRIDAY, 6 JUNE 2008

1400 - 1600 hrs

Examination paper inserts:

Notes for the guidance of candidates:

1. Non-programmable calculators may be used. 2. All formulae used must be stated and the method of working and ALL intermediate steps must be made clear in the answer.

Materials to be supplied by colleges:

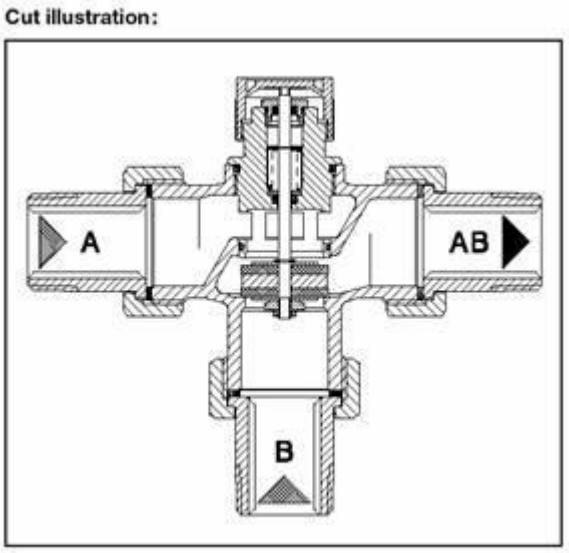
Candidate's examination workbook

AUXILIARY EQUIPMENT

Attempt ALL questions

Marks for each question are shown in brackets

1. (a) Sketch a section through a 3-way mixer valve. Page 26 of notes



(b) State an application for this type of valve. Can be manually controled bathroom shower

2. (a) State FOUR types of pumps suitable for use in a hydraulic system.
(b) Gear
(c) Vane
(d) Screw
(e) Variable Delivery

(f) Explain why the pumps stated in Q2(a) are suitable for hydraulic systems.
They are Positive Displacement Pumps.
Capable of very high output pressures of up to 300 Bar or more
PD Pumps are usually equipped with pressure relief valves to do with high pressures that can occur due to discharge blockage or system overload.
They can be uni or bi-directional – the latter providing oil flow in both directions.
The Hele – Shaw and Swash Plate can also be variable Delivery

3. (a) State how gearbox oil may become contaminated with water.
Leak from the cooler or condensation

(b) Explain the effects of water contamination of gearbox oil.

Loss in Break down of the oil. Promote Bio-Degredation leads to scuffing

(c) Describe the actions to be taken should a gearbox become contaminated with water.

Drain Oil
Wipe Out
Place a dryer in the gearbox
Inspection of Gbox and all parts 9teeth bearings)
Put in new oil and filters
Test and monitor pressures and pressures
Test oil before change and send new sample after 24 – 72 hours after send sample to lab to check for any contaminates.

4. With reference to a windlass that is hydraulically operated by a variable displacement motor, explain the effect of changing EACH of the following:

Page 71 on notes

(a) the flow rate of hydraulic oil; Speed changes

(b) the displacement of the motor. Changes the Torque

5. (a) List THREE defects that may be found during an inspection of a fixed bladed propeller, stating the possible cause of EACH.

Tip Broken Off, by Driving in to a reef

Fowling Of Propeller, fishing line caught around propeller

Growth surface of the propeller, deduces performance and puts extra load on the engine.

(b) State the likely consequences if the defects stated in Q5(a) are not rectified.

Cavitation , Increased fuel consumption, Slower speeds for same RPM, cause fatigue on prop shaft and damage through out the complete drive train.

Cavitation is the formation of vapour bubbles of a flowing liquid in a region where the pressure of the liquid falls below its vapor pressure.

6. Explain the circumstances under which EACH of the following devices fitted to an air compressor may operate:

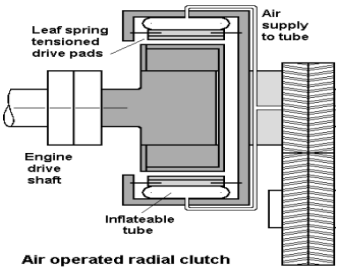
fusible plug; 150 C High

bursting disc. If the air cooler developed a leak/hole and the jacket water was pressurised by the compressor pressure

b, State where EACH device in Q6(a) may be fitted.

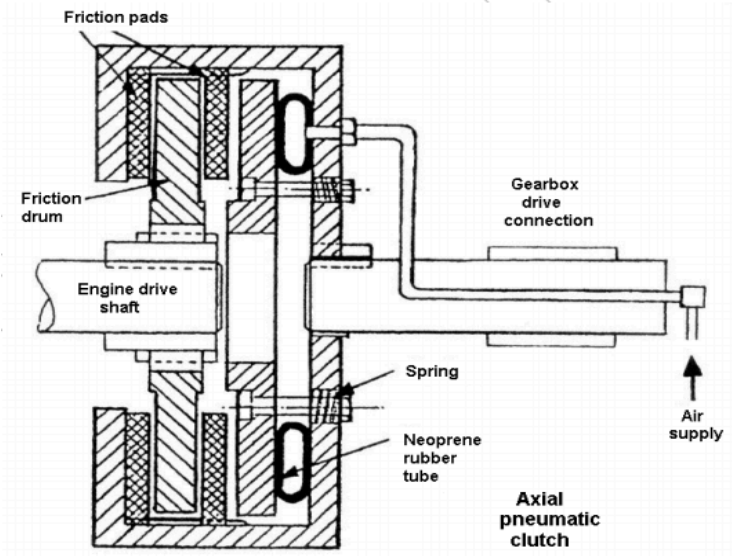
The fusible plug is on the end of the compressor on the LP side and HP side of the compressor

7. (a) Sketch a pneumatically operated friction clutch, labelling all parts.



Air operated radial clutch

Axial air operated clutch

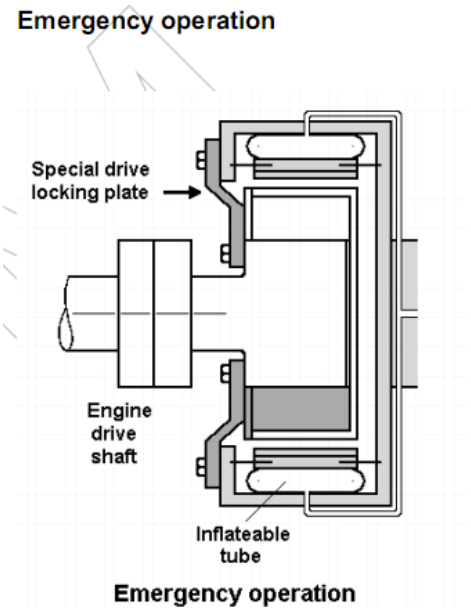


Axial pneumatic clutch

This type of clutch uses a neoprene tube that is inflated by air. Expansion of the tube produces a sandwich action between friction pads and disc. The friction drum is spline mounted and therefore has axial float.

The friction pads are also free to float axially; being mated with teeth machined peripherally inside the casing. Springs cause disengagement of the clutch when the tube is deflated.

(b) State how the clutch sketched in Q7(a) may be operated in the event of air failure.



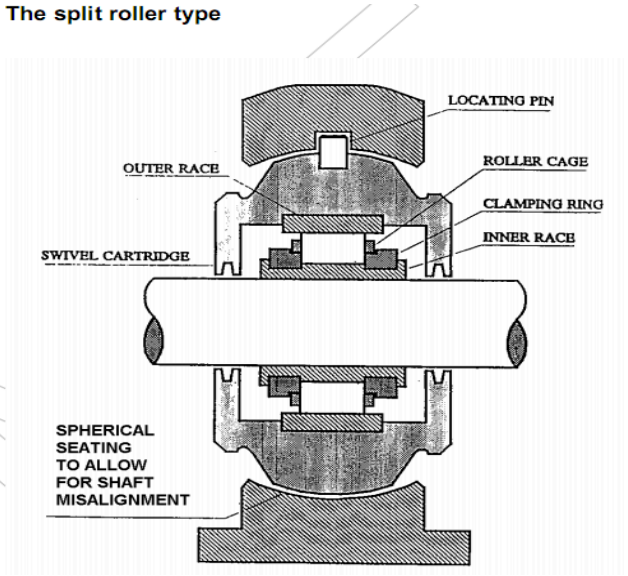
Failure of the air supply or other fault could render a clutch inoperative. To make provision for this eventuality, an emergency drive locking plate or set of temporary coupling bolts is provided.

Prolonged use of the emergency solid coupling arrangement can result in serious damage to gear teeth.

8. With reference to intermediate shaft bearings of the roller type, describe, with the aid of a sketch, EACH of the following:

(a) how some angular misalignment of the shaft is accommodated; Use dial gauge and laser target to aline shafts.

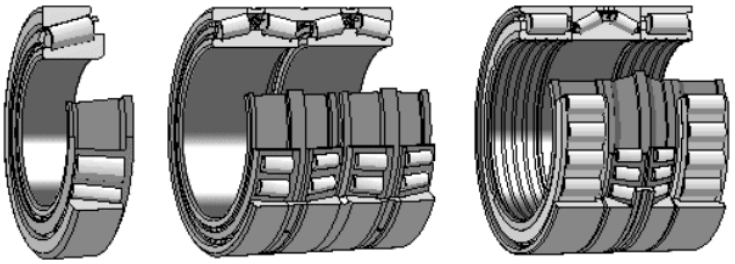
(b)



(c)

(d) how longitudinal movement of the shaft is accommodated. With tapered roller bearing

Taper roller bearings

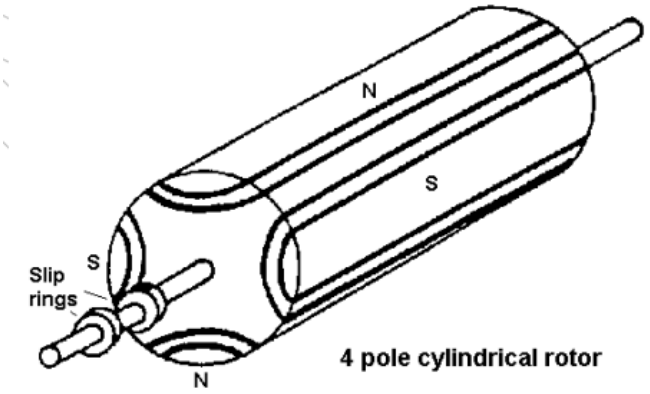


Types taper roller bearings

Smaller engine gearbox / thrust block combinations employ taper roller bearings, that are able to absorb axial thrust.

9. (a) Describe the construction of a *cylindrical* a.c. generator rotor.

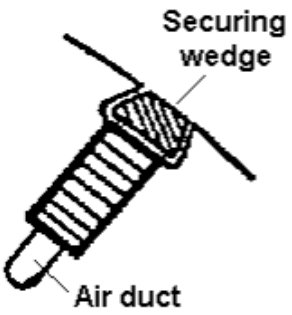
Rotor construction



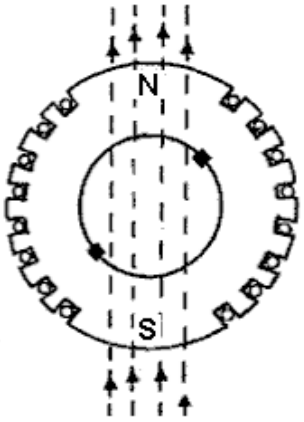
The rotor construction is of the form shown to the left.

The field winding consists of ***solid copper conductors***, insulated from one another and inserted into slots machined into the rotor body.

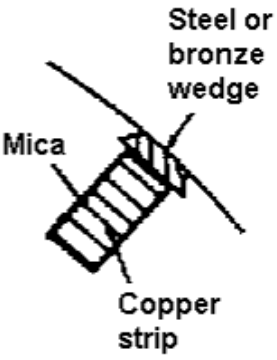
The field windings are connected so as to form concentric coils. A 2 pole or 4 pole configuration is possible.



Large alternator fitting



2 pole cylindrical rotor arrangement



Small alternator fitting

(b) Explain the rotational speed required for a 4 pole rotor to supply a frequency of 60Hz.

F = n x p 60 = x 2 p = f / n

FEQ = THE NUMBER X OF THE NUMBER OF PAIRS OF POLES 1800 RMP

10. Describe the procedure for insulation testing a 3-phase induction motor.

Discuss with chief work to be done
Risk Assessment
Permit to Work
PPG
Lock out Breaker and Fuse
Put Up signs
Check Test equipment
Disconnect everything electrical from the motor
Do a megger Test for insulation resistace between the frame and the winding
Reasemble and record in Log

Users for a 3 way thermostatic 3 way valve,Jacket water and lube oil cooler air cooler.