

Q1 (16 marks)

- (a) Explain the possible reasons of Main Engine T/C vibration while operating at a steady speed. (4)
- (b) State how the incidence of turbo charger vibration can be minimized. (4)
- (c) Explain the action to be taken in order to maintain 2 stroke – engine operation in the event of a out of service turbo charger. (4)
- (d) How is the engine operation affected when operated with a by-passed T/C (4)

Q2 (16 marks)

- (a) Sketch a sealing arrangement for an oil lubricated stern tube. (7)
- (b) Identify the common forms of seal failure. (3)
- (c) State how oil loss due to seal failure can be restricted whilst on Passage. (3)
- (d) How the aft bearing is designed to minimize the concentrated load? (3)

Q3 (16 marks)

- (a) Why is the axial clearance of a main thrust bearing an important dimension? (6)
- (b) How is this clearance measured? (4)
- (c) Describe how the thrust pads are removed for inspection and state what you would look for in particular. (6)

Bearings

Q4 (16 marks)

- (a) Describe, with the aid of a sketch, a waste heat recovery system for electrical generation using main engine exhaust gas in combined gas/steam turbine systems. (8)
- (b) Describe the operation of the waste heat recovery system described in part (a) whilst the associated main engine is running. (8)

Q5 (16 marks)

With reference to LNG diesel engine installations:

- (a) Describe, with the aid of a sketch, a Gas Valve Unit, explaining its purpose and indicating where it is located in the gas train. (8)
- (b) Explain why ventilation and inert gas systems must be installed with the engine fuel gas system. (4)
- (c) State why pilot injection must be provided when burning fuel gas, explaining how a pilot injection system works (4)

Q6 (16 marks)

- (a) Explain why highly efficient diesel engines tend to produce more NO_x than low performance diesel engines. (5)
- (b) Describe, with the aid of a sketch, a Selective Catalytic Reduction (SCR) unit for a marine propulsion diesel engine. (6)
- (c) Explain why accurate monitoring of the exhaust gas flows entering and leaving a Selective Catalytic Reduction unit are required and how these readings are used to control the reduction chemical supplied to the SCR unit. (5)

Q7 (16 marks)

With reference to electronically controlled engines:

- (a) Describe how fuel injection quantity and timing is adjusted. (6)
- (b) Describe how the exhaust valve timing may be varied. (5)
- (c) Describe how starting air valves are regulated. (5)

Electronic engine & common rail

Q8 (16 marks)

Sketch and describe the arrangement of a main engine camshaft chain. Describe the repair procedure following fracture of one chain link during operation of the engine. Give possible reasons for the failure and explain how the chain is set initially at the correct degree of tension. (16)

Camshaft & chain drive

Q9 (16 marks)

- (a) Define the term Torsional Vibration with respect to an engine crankshaft, stating the effect that high levels of such vibration can have on an engine crankshaft. (6)
- (b) Explain how engine deterioration influences the risk of Torsional Vibration, stating what can be done to minimise that risk. (6)
- (c) Explain TWO possible reasons for the activation of a Torsional Vibration alarm after an engine has been started if there had been no previous history of such an alarm and if no maintenance had been undertaken on the engine whilst it was stopped. (4)