



Sr. No. 7(B1)

EXTRA FIRST CLASS EXAMINATION (PART-B)

Subject: Maritime Regulations (B1)

(Time allowed - 3hours)

India (July 2018)

Total Marks 60

Note:

- (i) All question carry equal marks.
- (ii) Answer any six questions
- (iii) The answers should be legible.

1. "The Maritime Safety Committee (MSC) adopted Resolution MSC.428(98) on **Maritime Cyber Risk Management** in Safety Management Systems in June 2017. The resolution states that an approved safety management system should take cyber risk management into account in accordance with the objectives and requirements of the ISM Code. Brief on actions that can be taken to support effective cyber risk management in shipping industry.
2. With respect to **Indian Ports Act**, a) Brief the Rules for the Safety of Shipping and the conservation of Ports.
b) Explain (i) Removal of lawful obstructions (ii) Fouling of Government moorings. (iii) Power to board vessels (iv) Power to require crews to prevent or extinguish fire. (v) Appointment and powers of health-officer.
3. (a) The Facilitation Committee, at its thirty-ninth session, approved the Guidelines for the use of electronic certificates on ships. With reference to this, explain the features that are essential for such **Electronic certificates**.

(b) Explain the mechanisms for verification, reporting and port state control enforcement to be ensured by Maritime Administrations for its effective implementation.
4. Describe the background and relevance of the **International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001**. Discuss the following under Bunker Conventions, comparing with other similar Conventions such as CLC'92:-
 - (a) Pollution damage & Exclusions.

- (b) Time limits for claims
 - (c) Liability of Ship owner & Limitations of Liability
 - (d) Compulsory Insurance & Financial Security.
5. Looking at the IMO Roadmap for **GHG Emission control**, discuss the short, mid-term and long-term strategies to reduce shipping's GHG emissions by at least 50% by 2050 compared to 2008.
6. (a) With reference to the new IMO regulation on **collection and reporting of the ships fuel consumption data (DCS)**, discuss the roles of ship operators, flag states, Recognized Organizations and IMO for its effective implementation.
(b) in your role as a Technical Manager, draft a circular to your fleet ships describing procedures to be followed by the ship-staff for the compliance of DCS.
7. India is one of the lead countries in the field of ship recycling. Explain the salient features of **Hongkong Convention on Ship Recycling** and discuss its potential impacts on Indian ship recycling industry.
8. Referring to latest **IMO regulatory changes**, write short notes on the following :-
(a) Amendments to 2008 related to anchor handling towing or lifting operations coming applicable from 1st January 2020.
(b) 2016 amendments to International Maritime Labour Convention 2006 applicable from 8th January 2019.
(c) FSS Code Amendments regarding Automatic Sprinkler Systems applicable from 1st January 2020.
(d) Amendments to HSC Code applicable from 1st January 2020.
9. Referring to the **Ballast Water Management Convention**, write short notes on the following amendments applicable from 1st November 2019 and their impact on shipping industry :-
(a) Ballast Water Management for ships (Reg B3).
(b) Survey & Certification requirements (Section E).
(c) Code for approval of Ballast Water Management Systems (Reg D3).



Sr. No. 7(B2)

EXTRA FIRST CLASS EXAMINATION (PART-B)
Subject: Management Techniques and Applications (B2)

(Time allowed - 3hours)

Total Marks 60

India (July 2018)

Note:

- (i) All question carry equal marks.
(ii) Answer any six questions
(iii) The answers should be legible.

1. When an entrepreneur conceives the idea of starting a business he/she has to prepare a plan, as to how to go about it. This plan may be called "Business plan". The typical contents of a business plan are: (i). Mission statement (ii). Main objectives (iii). Business Environment (iv). Strategy (v). Project (vi). Financial Forecast (vii). Human Resources and (viii). Concluding Remarks.
Prepare a business plan assuming that you envisage starting your own shipping company.

2. (a) Explain the construction of a Decision Tree. What do you mean by it? What are the advantages and limitations of the Decision Tree approach.
(b) ABC corporation plans going on with three subsidiary projects with minimum investments; Project A with an investment of Rs. 4000 and projects B and C with Rs. 6000 and Rs. 5000 respectively. The projects are trial projects and have chances to be successful.

Projects	3. A	4. B	5. C
Probability of success	6. 0.8	7. 0.4	8. 0.5
Profit if successful	9. 20000	10. 25000	11. 24000
Loss if fails	12. 2000	13. 2000	14. 1000

Draw a decision tree and take decision.

3. (a) Define the following, with respect to Project Management:-
i. Critical Path
ii. Free Float
iii. Operational Management

(b) Obtain the critical path for following network :

Activity	Duration	Activity	Duration
1-2	3	4-5	4
2-3	9	4-7	8

2-4	11	5-8	6
3-5	7	6-8	3
3-6	4	7-8	9

4. How interdependencies between events and activities are shown through the construction of project networks? Define events and activities in the context of a network analysis. With the help of an example, explain the critical path and slack in the network.
5. A company has to decide whether to drill a certain prospect. If it drills the prospect, the experts expect
 - a. Probability of zero reserves to be 60%
 - b. Probability of 60,000 barrels to be 30% &
 - c. Probability of 90,000 barrels to be 10%

The cost of drilling is \$65,000. Each barrel can yield two dollars. Based on this information, determine the optimum course of action the company should take in order to maximize its EMV.

6. (a) Discuss the role of manager.
(b) What is Organization Structure? Bring out the factors affecting centralization and decentralization of an organization. Also highlight the merits and demerits of centralization and decentralization with examples.
7. (a) State the standard form of Linear Programming Problem. Discuss the advantages and limitations of Linear Programming Problem.

(b) Solve the linear programming

$$\text{Maximize } Z = 25X_1 + 40X_2$$

$$\text{Subject to: } 2X_1 + 4X_2 \leq 100$$

$$3X_1 + 2X_2 \leq 90$$

$$X_1, X_2 \geq 0$$

8. (a) Compare the two **material management** technique namely, "FSN" with Selective Inventory control for usefulness and limitation for Ship owning company.
(b) Selective Inventory Control (ABC Control) analysis provides a mechanism for identifying items that will have a significant impact on overall inventory cost. Discuss this material management method technique for a ship's engine room.
9. An equipment manufacturing company manufactures Equipment A and Equipment B. Equipment A requires 8 labor-hours for assembling and 2 labor-hours for finishing. Equipment B requires 2-labor hours for assembling and 1-labor hours for finishing. The maximum labor hours available per day for assembly and finishing are 420 and 120, respectively. The Equipment A is sold for \$50, & Equipment for \$15, find the maximum profit that can be achieved.



EXTRA FIRST CLASS EXAMINATION (PART-B)

Subject: Naval Architecture (B3)

(Time allowed - 3hours)

India (July 2018)

Total Marks: 60

Note:

- (i) All question carry equal marks.
- (ii) Answer any six questions
- (iii) The answers should be legible.

1. (a) With a neat diagram explain the typical Curve of Statical Stability and annotate the information that can be obtained from it.
(b) Explain the significance of the point of inflection on the curve.
(c) Prove that the ordinate of a point corresponding to angle of heel one radian on the tangent drawn at the origin to the curve, is equal to the initial GM.
2. (a) Bring out the merits and demerits of longitudinal framing system. Which of the demerits are mitigated by use of mixed framing system without affecting the merits? Explain.
(b) List and explain with a sketch the type of loads and failure mechanisms that would be of concern for the longitudinal strength of the Hull girder of a bulk carrier.
3. Improvements in Rudder efficiency can considerably contribute in improving propulsion effectiveness. Discuss common rudder-efficiency improvement devices / techniques currently in use , referring to the following:-
 - a) Rudder Thrust Fins
 - b) Asymmetric Rudders
 - c) Rudder Bulbs
 - d) Grim Vane Wheels.
4. State Froude's Law of Similarity in the context of ship resistance. How are ship and model speeds related? What is ITTC friction line and how is this used in ship resistance extrapolation from model data?

5. (a) Describe the various aspects that are considered to **estimate engine power** and the influence of various factors.
 (b) Using typical engine power versus engine speed diagram and propeller demand curves, discuss the relation between the maximum rated output of the propulsion plant and the power for which the propeller is designed.

6. (a) Describe the **ship design process** and discuss the various phases of design?
 (b). How is longitudinal metacentric radius calculated?-How does this value differ from longitudinal metacentric height? How do you get MCT 1 cm? Where is it used and how?

7. (a) What are the considerations in selecting (i) the number of **propellers** in a ship, (ii) the number of blades in a propeller, (iii) the propeller diameter, (iv) the rake of the propeller blades, and (v) the propeller blade skew?
 (b) Using the axial momentum theory of propellers prove that the efficiency of a propeller modelled as an actuator disc even under ideal conditions is less than unity.

8. (a) During end on **launching**, the ship experiences variation on stresses on its structure. Discuss this launching process and explain which are the critical positions where maximum stress can be experienced during the travel and how is the structure to be strengthened for this purpose.
 (b) A newly constructed vessel, when launched to water, tilts to portside by 3 degrees and stays at that inclination. Discuss the reason for the same and its initial stability. Draw a sketch of the righting lever curve for such a condition.

9. What do you understand by the **continuity of structure**? With the help of neat sketches discuss how the continuity of the structure is maintained at the following places
 - a. Intersection of a transverse watertight bulkhead and a bottom longitudinal.
 - b. Joint at the intersection of the deck and ship's side (using a beam knee).



EXTRA FIRST CLASS EXAMINATION (PART B)
Subject: Vibration Engineering

(Time Allowed –3 Hours)

Total Marks 60

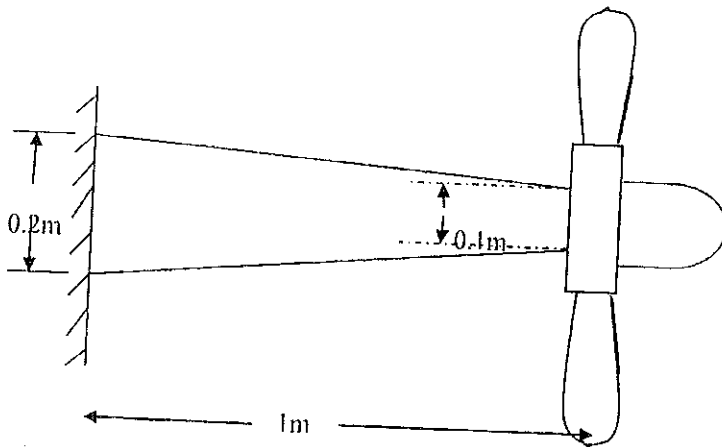
India (2016)

NB: (1) Attempt any SIX questions only.

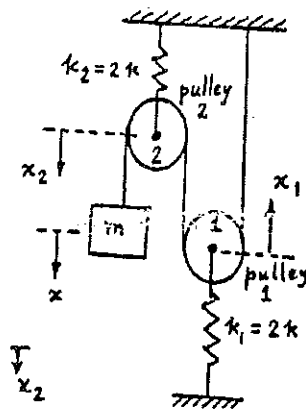
(2) All questions carry equal marks.

(3) Neatness in handwriting and clarity in expression carries weightage.

1. State the sources of excitation for ship hull vibrations. What system parameters should be controlled in the design stage itself, so as to reduce ship vibrations?
2. State the different types of machinery mountings which can be used onboard the ship. Which properties of the mounting system should be manipulated and why?
3. i) Give two examples of a mechanical vibration exciter and briefly describe the same.
ii) What is the purpose of experimental modal analysis?
iii) How are orbits used in machine diagnosis?
4. i) What is the principle of mode superposition? What is its use in modal analysis?
ii) State three methods of representing the frequency response data.
5. A machine of 75 kg is mounted on three springs each of stiffness 10 N/mm and is fitted with a dashpot to damp out vibrations. During vibrations it is found that the amplitude of vibrations diminishes from 38.4 mm to 6.4 mm in two complete oscillations determine
 - i) the resistance of dashpot at unit velocity
 - ii) the frequency ratio of damped vibrations to undamped vibrations
 - iii) the periodic time of damped vibrations
6. A tapered solid steel propeller shaft is shown in Fig. Determine the torsional spring constant of the shaft.



7. Find the natural frequency of the pulley system shown in Fig.



8. Consider a spring-mass system, with $k = 4000 \text{ N/m}$ and $m = 10 \text{ kg}$, subject to a harmonic force $F(t) = 400 \cos 10 t \text{ N}$, Find the total response of the system under the following initial conditions:
 a) $x_0 = 0.1 \text{ m}$, $\dot{x}_0 = 0$; b) $x_0 = 0$, $\dot{x}_0 = 10 \text{ m/s}$; c) $x_0 = 0.1 \text{ m}$, $\dot{x}_0 = 10 \text{ m/s}$,

9. Design a solid steel shaft supported in bearings which carries the rotor of a turbine at the middle. The rotor weighs 225 kg and delivers a power of 149.14 kW at 3000 rpm. In order to keep the stress due to the unbalance in the rotor small, the critical speed of the shaft is to be made one-fifth of the operating speed of the rotor. The length of the shaft is to be made equal to at least 30 times its diameter. Take E as 200 GPa.

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Sr. No. 7 (B5)

EXTRA FIRST CLASS EXAMINATION (PART-B)

Subject: Advanced Marine engineering Knowledge (B5)

(Time allowed - 3hours)

India (July 2018)

Total Marks 60

Note:

- (i) All question carry equal marks.
- (ii) Answer any six questions
- (iii) The answers should be legible.

1. (a) With Respect to gas burning engine options available for ships, discuss various gas injection systems used and their merits & demerits, stressing on the technical, commercial and environmental areas.
(b) Discuss the current scenario of regulatory requirements in this regard with special reference to i) Explosion Prevention & Engine Room Ventilation arrangements. ii) LNG Tanks & gas system installations.
2. Viscous (frictional) resistance is a major component of overall resistance and hence an important area of attention for **energy efficiency improvement** of ships. Explain various skin friction reduction methods currently under consideration, with special mention on the following:-
 - a) Hull Air Cavity systems
 - b) Hull surface texturing.
 - c) Micro bubbles.
3. Periodical **Lub oil analysis**, its correct interpretation and corrective measures are of critical significance for the maintenance of marine machineries. With reference to the modern analysis techniques employed for the condition analysis of LO, discuss the following:-
 - a) Elemental (Spectrometric) Analysis
 - b) Fourier Transform Infrared (FTIR) Spectroscopy
 - c) Particle Count
 - d) Base Number Vs Acid Number

4. When **electronically controlled camshaft** less engines were introduced, it was thought that engines with camshaft will become obsolete. However the dominant engine maker has introduced an engine with **electronically controlled fuel injection**, but with a camshaft too. Explain the reasons for this and describe the features of this engine.
5. With regard to a shell and tube type **heat exchanger**, explain the variables that have to be considered in deciding which fluid will flow through the tubes and which through the shell. Give examples. Are there exceptions? If so why? In spite of many advantages, the plate type of heat exchanger has not fully replaced the shell and tube in many applications. Give your opinions regarding the reason.
6. (a) With respect to modern **instrumentation and control**, explain the difference between analogue signals and digital signals? What are the advantages of digital signals. What are communication protocols such as MODBUS?
(b) With regard to the various machinery alarms systems, list possible errors and wrong practices which should be avoided while testing and calibrating these.
7. (a) What is the meaning of "**de-rating**" of machinery?
(b) Explain the principles behind de-rating a ship propulsion engine as a retro fit and the benefits. Can a de-rated engine be run at full power? If yes, under what conditions?
8. Journal bearing lubrication is strongly influenced by the characteristics shown in the "Stribeck" curve. Justify the developments that have taken place in the **connecting rod bearings** of both medium speed engines and slow speed engines in this context.
9. The operating characteristics of the compressor of a **turbocharger** is shown by the relation between discharge pressure ratio and flow rate. Explain the reason for the shape of the curves in the compressor operating map. Discuss the challenge in improving compressor efficiency and avoiding surging.



Sr. No.7 (B6)

EXTRA FIRST CLASS EXAMINATION (PART-B)

Subject: HUMAN ELEMENT (B6)

(Time allowed - 3 hours)

India (July 2017)

Total Marks 60

Note:

- (i) All question carry equal marks.
- (ii) Answer any six questions.
- (iii) The answers should be legible.

1. (a) Refer to the ISM code and discuss how the basic principle of risk assessment and risk minimization is addressed in it and emphasized.
(b) Discuss various techniques for 'Risk Assessment' applied onboard, with brief description on any two of the following techniques:-
 - i. Fault Tree Analysis (FTA)
 - ii. Failure Modes and Effects Analysis (FMEA)
 - iii. Event Tree Analysis (ETA)
2. (a) Discuss the broad overview of the relevant IMO, ILO regimes relating to the Human Element in the maritime industry such as maritime labour and welfare.
(b) Discuss the IMO guidance on Fatigue Mitigation and Management on board ships.
3. (a) Write in detail on situational leadership with reference to the different styles of leadership and their application. Give shipboard examples.
(b) Keeping any management techniques such as McKinsey 7S frame work in mind, briefly discuss effects likely to be felt if a good number of 'staff' in any organization is changed in a relatively shorter time space.
4. With Reference to MLC 2006 answer the following:
 - (a) Why a new convention needed when you already have ILO requirements.
 - (b) Explain the structure of the convention with titles.

(c) Briefly discuss DMLC Part I and Part II covering fourteen welfare points for seafarers

5. "Unsafe acts" committed by the front line operators have been put in categories of errors, mistakes and violations in the GEMS model of James Reason. Explain this model with suitable examples from the maritime field.
6. Proactive approach to rule making is adapted through Formal Safety Assessment methodology. Explain the elements of FSA. How does the risk management concept of ALARP fit in this methodology?
7. (a) Using Johari's window for improving interpersonal awareness, what area needs to be maximized and why?
(b) Do a quick SWOT Analysis mentioning at least 3 points each to improve employment opportunities of Indian Seafarers?
8. (a) Discuss the factors that you will keep in mind the most to motivate a group of subordinates.
(b) As a senior, what points you will take into consideration while providing feedback to your juniors regarding improving interpersonal awareness.
9. Key element of the Occupational Health & Safety aspects of a management system is to have strong safety culture and how they contribute to improving safety within the organisations and marine environment. With reference to OH & S, brief your answer for the improvement safety culture in your shore based company as well on your controlled ships.
