Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – December 2023

Programme Name: B.Tech (Marine Engineering)

Semester: IV

Subject Code: UG11T4402

Subject Name: Marine Turbo Machinery

Date: 21.11.2023	Max Marks: 70
Duration: 03 Hrs	Pass Marks: 35

General Instructions

(i) All Sections (A, B & C) are to be attempted.
(ii) Options, if any, are specified in respective section.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. A single-stage impulse turbine is also known as

a) Curtis stage turbine

b) Reaction turbine

c) De Laval turbine

d) Rateau turbine

2. Compounding of steam turbine is done to

a) Balance the rotor

b) Reduce the blade friction

c) Reduce the rotor speed

d) Connect the shaft of one turbine to that of another

3. The reheating of steam in a turbine

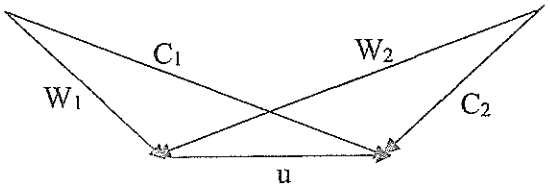
a) Increases the workdone through the turbine

b) Increases the efficiency of the turbine

c) Reduces wear on the blades

d) All of the above

4. In the velocity diagram shown below



u = blade velocity

C = absolute fluid velocity

W = relative velocity of fluid

The subscripts 1 and 2 refer to inlet and outlet.

Then the diagram is for,

a) An impulse turbine

b) A reaction turbine

c) A centrifugal pump

d) An axial flow compressor

5. In steam turbines carry over losses are due to _____

a) increase in temperature

b) formation of eddies in annular spaces

c) decrease in pressure

d) none of the mentioned

6. Rotating disks are subjected to _____

a) mechanical stress

b) thermal stress

c) mechanical & thermal stress

d) none of the mentioned

7. Shrouding is done to _____ blades.

a) small

b) large

c) every

d) none of the mentioned

8. When compressor operates at _____ choking takes place.

a) high mass

b) low mass

c) high temperature

d) none of the mentioned

9. Which of the following statements are true for dimensional analysis?

a) The functional relationship between dependent and non-dependent variables can be expressed into dimensionless terms by dimensional analysis.

b) It is used to change the theoretical equation into a dimensionless form.

c) It helps to convert the units of quantities from one system to another system.

d) All of the above

10. In model testing of Ship, the forces present in dynamic similarity are

a) Inertia forces

b) Gravity forces

c) Viscous forces

d) All of the above

Section B

Five Questions of 02 Marks each

11. Why are steam turbines compounded?

12. Distinguish between the model and prototype.

13. How is degree of reaction defined? What is a 50% reaction turbine?

14. Why does the effectiveness of Curtis stage decreases as the number of moving blades increases?

15. Write short notes on blade fastening.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. (a) Explain steam turbine with schematic diagram? (3 Marks)

(b) Draw the schematic diagram of pressure – velocity variation in different types of compounding in Impulse and Reaction Turbine. (7 Marks)

17. In a stage of an impulse turbine provided with a single row wheel, the mean diameter of the blade ring is 800 mm and the speed of rotation is 3000 rpm. The steam issues from the nozzles with a velocity of 300 m/s and the nozzle angle is 20°. The rotor blades are equiangular and the blade friction factor is 0.86. What

is the power developed in the blading when the axial thrust on the blades is 140 newtons? (10 Marks)

18. (a) How the performance characteristics of compressor is defined and draw a characteristics curve of high-speed compressor? (5 Marks)

(b) Explain the following performance coefficients (i) flow coefficient (ii) rotor enthalpy loss coefficient (iii) diffuser enthalpy loss coefficient (iv) loading coefficient. (5 Marks)

19. (a) Derive Euler's turbomachinery equation. (4 Marks)
(b) Write down the difference between axial and centrifugal compressor. (3 Marks)
(c) What is slip factor? (3 Marks)

20. (a) Derive the expression for maximum efficiency of a simple impulse turbine. Use usual nomenclature for velocity components and associated angles. (5 Marks)

(b) What is the specific speed? Write down the range of specific speed of various type of turbomachine. (5 Marks)

21. (a) Explain Gas turbine for ship propulsion and draw the general layout. (5 Marks)

(b) Explain the difference between constant pressure turbocharging and pulse turbocharging with neat sketch and comment on its utility. (5 Marks)

22. (a) What are the various types of internal and external losses occur in a steam turbine? (7 Marks)
(b) What do you understand by carry over efficiency? (3 Marks)