Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – March/April 2024

Programme Name: B.Tech Marine Engineering

Semester: Four

Subject Code: UG11T4402

Subject Name: Marine Turbo Machinery

Date: 16.03.2024	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 Rateau turbine is....

a. Reaction turbine
b. Pressure compounded impulse turbine
c. Velocity compounded impulse turbine
d. Pressure and velocity compounded impulse turbine

2. What is a Curtis stage?

a. Pressure compounded impulse turbine
b. Impulse - reaction turbine
c. Velocity compounded impulse turbine
d. Pressure and velocity compounded impulse turbine

3. The function of inlet guide vane in an axial flow air compressor is to ....

a. Direct and straighten the incoming air from the rotor blades
b. Direct and straighten the incoming air for the stator blades
c. Direct and straighten the incoming air from the stator blades
d. Direct and straighten the incoming air for the rotor blades

4. In gas turbine, intercooler is placed ....

a. Before low pressure compressor
b. In between low pressure compressor and high pressure compressor
c. In between high pressure compressor and turbine
d. None of the mentioned

5. De-Laval turbine is a ....

a. Single rotor impulse turbine
b. Reaction turbine
c. Axial flow turbine
d. Multi-rotor impulse turbine

6. Efficiency of gas turbine increases when...

a. Pressure ratio increases and exhaust gas temperature decreases.
b. Pressure ratio decreases and exhaust gas temperature decreases.
c. Pressure ratio increases and exhaust gas temperature increases.
d. Pressure ratio decreases and exhaust gas temperature increases.

7. The value of Mach number when flow chocked in air compressor is—

a. M=0.5
b. M=1
c. M=0.6
d. M=0.2

8. Number of blades in centrifugal compressor increases as slip factor—

a. Increases
b. Decreases
c. First increases and then decreases
d. First decreases and then increases

9. Dynamic similarity is said to exist between the model and the prototype when—

a. Ratios of the forces acting at the corresponding points in the model and prototype are the same in magnitude; the directions also should be parallel.

b. Ratios of the forces acting at the corresponding points in the model and prototype are the same in magnitude.

c. Ratios of the velocity and acceleration acting at the corresponding points in the model and prototype are the same in magnitude

d. Ratios of the velocity and acceleration acting at the corresponding points in the model and prototype are the same in magnitude; the directions also should be parallel.

10. Working of a pulse pressure turbocharger depends upon the _____ that can be safely created in the exhaust system.

a. Enthalpy drop
b. Pressure difference
c. Turbocharger rpm
d. Pressure pulses

Section B

Five Questions of 02 Marks each

11. Write advantages of Model Analysis.
12. Explain slip in centrifugal air compressor.
13. Describe specific speed of a turbomachine.
14. State the purpose of using shrouding in steam turbine blades?
15. Why are steam turbines compounded?

Section C

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

16. **(a)** Explain starting and ignition system in gas turbine. **(5Marks)**

(b) Explain the concept of blade cooling in gas turbines. **(5 Marks)**

17.**(a)** Draw the schematic diagram of Velocity compounding and pressure compounding of the Impulse Turbine. **(6marks)**

(b) Classify the steam turbine **(4marks)**

18.**(a)**Draw the typical Marine gas turbine propulsion plant (Twin spool arrangement with free turbine) **(6marks)**

(b) Draw the reheat cycle & T-s diagram for gas turbine **(4Marks)**

19.**(a)**Explain different losses in centrifugal compressor. **(5marks)**

(b) Draw inlet and outlet velocity triangles for axial flow air compressor**(5Marks)**

20.**(a)** Derive Euler's Turbomachinery equation **(6Marks)**

(b) Define stage loading and degree of reaction for axial flow air compressor (**4Marks)**

21. **(a)** Explain the different types of similarities. **(6Marks)**

(b) Draw a characteristic curve for high speed turbine**(4Marks)**

22. **(a)** Explain Pulse Turbocharging system. **(7Marks)**

(b) List out various advantages and disadvantages of constant pressure turbocharging system**(3Marks)**