Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – December 2022

Programme Name: M. Tech (NAOE)

Semester: III

Subject Code: PG11E2302

Subject Name: ANALYSIS OF OFFSHORE STRUCTURES

Date: 12.12.2022	Max Marks: 60
Duration: 03 Hrs	Pass Marks: 30

Section A:

Answer all the MCQS (10 M)

1. Structural damping for steel in the range of ---------- and for that of the concrete is ----------.
   a) 0.2-0.5 % and 0.5 to 1.5%
   b) 0.5-1.5 % and 1.5 to 2.5%
   c) 0.75-1.5 % and 1 to 2.5%
   d) 1.5-2.5 % and 1.5 to 2.5%
2. Free vibration experiment is carried out to determine the ---------- -------- and _____ for the setup.
   a) Natural frequency and displacements
   b) Mode shapes and displacements
   c) Natural frequency and damping coefficient
   d) Time period and displacements.
3. ---------- method is used to determine the damping coefficient
   a) Energy method
   b) Newtons method
   c) Logarithmic Decrement
   d) All the above

4. API-RP 2A recommends to use the chart for such selection based on the ---------- and ----------.
   a) d/gt2 and H/ gt2
   b) Relative water depth and Wave steepness
   c) both
   d) all the above

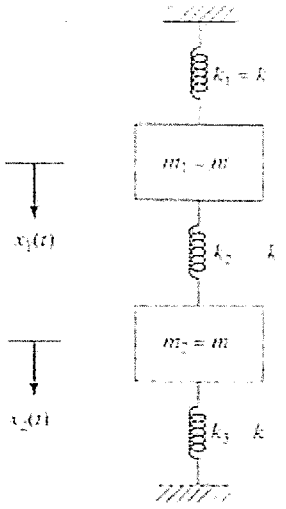
5. A motion that repeat itself after equal interval of time is called ---------
   a) Vibration
   b) Oscillation
   c) Frequency
   d) Periodic motion
6. If spring with stiffness K_1 and K_2 are connected in parallel , their effectiveness is equal to
   a) K1 x K2
   b) K1 +K2
   c) 1/K1 x1/ K2
   d) 1/K1 +1/ K2
7. In the vibratory system , if the amount of the external excitation is known in magnitude it's called
   a) Indeterministic vibration
   b) Deterministic vibration
   c) Both
   d) none
8. The tension leg platform is heave restrained by .....
   a) Horizontal tendons or tethers
   b) vertical tendons or tethers
   c) Horizontal and Vertical tendons or tethers
   d) none
9. TLP with perforated columns shows ---------- and ---------- in comparison to that without perforated columns
   a) Higher damping coefficient and Higher time period
   b) Higher damping coefficient and Lower time period
   c) Lower damping coefficient and lower time period
   d) Lower damping coefficient and higher time period
10. Rayleigh damping can be mathematically represented
   a) $C=a_0M+a_1k$
   b) $C=a_0M-a_1k$
   c) $C=[a_0M\ ]+a_{1[}[k]$
   d) None

Section B:

Answer 5 out of 7 Questions (8 Marks x 5 = 40 Marks)

11. How do you describe the behaviour of the physical system in terms of its motion as a function of time? What are the different methods to write the equation of the motion?
12. List the types of the damped systems and sketch the responses neatly. A vibrating system is defined by the following parameters M=3kgs, K=100N/m, and damping coefficient is 3Ns/m. Determine the damping factor, the natural frequency of the damped vibration, logarithmic decrement, the ratio of two consecutive amplitudes and the no of cycles after which the original amplitude is reduced to 10percent.

13. In a two degrees of freedom system shown in the below figure. Let all the masses and stiffness are equal in magnitude and determine the natural frequencies of vibrations and their amplitude ratios.

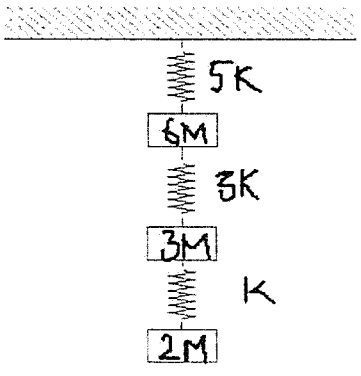


14. A simply supported beam of length l and mass M carries a concentrated mass M at the centre and at the centre the deflection is a, Find its natural frequency of its transverse vibration.
15. Write down the equation of motion of a multi- degrees of freedom in terms of influence coefficients.
16. Explain the levels of reliability? List the advantages of the Reliability methods.
17. Write short notes on Rayleigh Damping.

Section C:

1 out of 3 Questions of 10 Marks Each = 10 Marks

18. Evaluate the fundamental frequency and mode shape for the MDOF system using Dunkley's method, Influence coefficient method, Stodolas method, and Rayleigh- Ritz method.



19. Explain step by step procedure to compute the Fatigue crack propagation.
20. If you were given to model a damped system of single degree of freedom model and it is subjected to a forced vibration how do you define all the damping parameters.