

(3 Hours)

Maximum Marks: 80

- N.B.** 1) **Question No. 1 is compulsory**
 2) Solve **Any Three** from remaining **Five** questions.
 3) Use of standard data book like PSG, Mahadevan and Kale Khandare is permitted
 4) Assume suitable data if necessary, giving justification

- Q1** Answer any **Four** from the following
- a) Explain lays in wire rope with construction of wire rope. **5**
 - b) Explain Design Methodology and Optimum Design **5**
 - c) State the significance of specific speed and NPSH in the design of a centrifugal pump? **5**
 - d) Explain why an I – section with $I_{xx} \leq 4 I_{yy}$ is selected for connecting rods of an I.C. Engine? **5**
 - e) Write assumptions made by Lewis and derive Lewis beam strength equation **5**
- Q2** The following specification refers to an EOT crane. **20**
- Application - Class II
 load to be lifted - 100 KN
 Hoisting Speed - 8 m/min
 Maximum lift -10 m
 Velocity of cross travel - 20 m/min.
 Velocity of long travel - 30 m/min.
- a. Select a standard hook, material and design stresses induced at the most critical section.
 - b. Select suitable type and size of the wire rope for an expected life of 12 months.
 - c. Design the pulley axle and select suitable bearing.
 - d. Design the rope drum.
- Q3** A centrifugal pump directly coupled to a motor is required to deliver 100 m³/hour **20**
 of water at 25⁰C against a total head of 50 m.
- a. Select the type of motor speed and determine the power.
 - b. Determine the impeller diameter, inlet and outlet vane angles and no. of vanes.
 - c. Design the impeller shaft.
 - d. Design the shape of the volute casing.
 - e. Decide diameters of the suction and delivery pipes.

- Q4 A 20° troughing belt conveyer has following specifications. **20**
Material to be conveyed = Lime stone, Maximum lump size = 125mm.
Capacity = 300 TPH, Inclination = 12°, Center distance = 50 m.
a) Determine width, number plies and thickness of belt.
b) Select proper motor for conveyer
c) Design the drive pulley along with its shaft
d) Design the troughing idler for the belt.
- Q5 A pair of straight bevel gear is used to transmit 25 kW power from output shaft of gear box to agitator shaft. The two axes are inclined at 85°. The agitator shaft rotates at 15 rpm and reduction ratio is 4:1. **20**
a) Selecting suitable material for bevel pinion and gear, find module, face width, pitch circle diameter and outside diameter of two gears to satisfy strength and wear criteria.
b) Give constructional detail of both gears.
c) Draw sketch of the two gears in assembled condition with leading dimensions.
- Q6a) A four stroke single cylinder water cooled diesel engine develops 7.5 kW brake power when operating at 1000rpm. **15**
a) Determine the size of engine (bore and stroke)
b) Design wet liner and cylinder.
c) Design piston with pin and piston rings
- Q6b) Illustrate the working of external gear pump with neat sketches. **05**

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Note: (1). Q.1 is Compulsory.
(2). Attempt any three questions out of the remaining five.

- Q.1 Attempt any four: **20**
- (a) What is meant by Supply Chain Management? What are the objectives of Supply Chain Management?
 - (b) What is meant by Bullwhip Effect in Supply Chain? How can it be reduced?
 - (c) What are the reasons for holding inventory?
 - (d) What are the objectives of Logistics Management? What are the factors affecting logistics function?
 - (e) How do businesses incorporate RFID into the Supply Chain?
- Q.2 (a) What are the challenges in establishing a global supply chain? **10**
- Q.2 (b) Discuss how to create a supplier scorecard in supplier performance evaluation. **10**
- Q.3 (a) What is the difference between a P system and a Q system in inventory control? **10**
- Q.3 (b) Find the optimum order quantity given that annual usage is 500 pieces, setup cost is Rs. 10, $I=20\%$, cost per unit is Rs. 100 **10**
- Q.4 (a) Discuss the factors in packaging that lead to efficient logistics management. **10**
- Q.4 (b). What is the difference between a forward supply chain and a reverse supply chain? **10**
- Q.5 (a) What is a Transport Management System (TMS)? What are its different components? **10**
- Q.5 (b) What is a Warehouse Management System (WMS)? What are the essential processes in a WMS? **10**
- Q.6 Answer the following: **20**
- a. What are the pros and cons of different modes of transportation?
 - b. What is the difference between takt time and lead time?
 - c. A company has received an order for 1,500 units of mugs that need to be manufactured in a period of 24 hours. Calculate the takt time. Assume that the firm has continuous manufacturing processes 24 hours a day.
 - d. What are the various design options for a distribution network? Draw their labelled sketches.?
 - e. What is meant by Supply Chain Resilience?

Duration: 3hrs

[Max Marks:80]

- N.B. :** (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]**
- a Explain the working of Solar Pond. **5**
 - b Explain various types of Fuel Cells. **5**
 - c Discuss the advantages & disadvantages of Geothermal energy **5**
 - d Explain OTEC system **5**
 - e What are the various types of biogas generation plants. **5**
- 2 a Define and explain the followings:- [5]**
(a) Latitude (b) Hour angle (c) Declination
- b State The various types of solar PV cells [5]**
- c Calculate the variation at day length OVER A YEAR (on 26Th of the month of year 2022) of the following location and plot the same on graph. & make your comments. Location: Mumbai (19.076⁰N,72.877⁰E) [10]**
- 3 a Discuss in brief, what are the effects of various parameters on the performance of flat plate collector. [10]**
- b Calculate the angle made by beam radiation with the normal to a flat plate collector on December 1, at 9.00 A.M., solar time for a location at 28° 35' N. The collector is tilted at an angle of latitude plus 10°, with the horizontal and is pointing due south. [10]**
- 4 a Explain The Various Methods to improve the efficiency of PV cells. [10]**
- b State The working principle of a solar PV system. [10]**

- 5 a Wind at 1 standard atmospheric pressure & 15⁰c has a velocity of 15m/s [10]
calculate, 1) the total power density in the wind 2) a maximum obtainable power density 3) the total power 4) the total torque & axial thrust. (Given data Turbine dia.=120M, turbine operating speed =40 RPM at max. efficiency assume propeller type wind turbine)
- b Discuss in details, the various Factors for selection of sites for wind mills. [10]
- 6 a The following data are given for a family biogas digester suitable for the output of 5 cows; the retention time is 20 days, temp. is 20⁰c, dry matter consumed per day =2kg. Biogas yield is 0.24m³/kg, the efficiency of burner is 60%, methane proportion is 0.8, heat of combustion of methane=28MJ/m³, calculate 1) the volume of Digester & 2) power available from digester. [10]
- b For a Rs. 12 lacs investment in solar energy equipment which meets 54 % of annual load of 160 GJ. If first year fuel cost is Rs. 750 per GJ and expected to inflate at the rate of 11 % per year. Determine [10]
- (a) Undiscounted payback time.
- (b) Discounted payback time if the discount future cost is at rate 8 %.

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- Note: 1. Q1 is compulsory
2. Solve any three from remaining

- Q1 Solve any Four out of Six** **20**
- A. Explain the benefits of Vibration based condition monitoring?
 - B. Describe the different applications of Laser Doppler vibrometry (LDV).
 - C. Explain the essential settings in Data Acquisition System (DAS).
 - D. Discuss the importance of continuous pump vibration monitoring.
 - E. Describe the characteristic of cavitation experienced in Centrifugal pump.
 - F. Explain the Unique reasons for mechanical looseness.
- Q2**
- A. Illustrate the concept prognosis and diagnosis in vibration-based condition monitoring with example. **10**
 - B. Explain the methods to diagnose the vibrations due to bearing faults? Also explain the vibration generated by defective rolling bearings. **10**
- Q3**
- A. Explain the main methods are used for attaching sensors to monitoring locations in predictive maintenance. **10**
 - B. What are the methods for shaft alignment and how do you diagnose a misalignment situation? **10**
- Q4**
- A. What is the effect of bent shaft on machine vibration? Also explain the monitoring frequency for bent shaft? **10**
 - B. Describe the methods to reduce the gearbox problems using condition monitoring. **10**
- Q5**
- A. What are the challenges that needed to be addressed by the vibration monitoring system in sugar mills. **10**
 - B. Explain the four classes of Fourier transform with graph. **10**
- Q6**
- A. Explain vibration-based condition monitoring and fault diagnosis in rotating machine. **10**
 - B. What Is Windowing? Describe Windowing functions with diagram. **10**

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(2) Attempt any three questions out of the remaining five.
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- 1 Attempt any FOUR [20]**
- a Differentiate between cybercrime and cyber fraud.
 - b Explain various threats associated with cloud computing.
 - c Explain methods of password cracking
 - d Explain E-contracts and its different types.
 - e Explain different attack vectors in cyber security
- 2 a Explain the classification of cybercrimes with examples. [10]**
b Explain various types of credit card frauds [10]
- 3 a Explain different buffer overflow attacks also explain how to mitigate buffer overflow attack [10]**
b Explain electronic banking in India and what are laws related to electronic banking in India [10]
- 4 a What do you understand by DOS and DDOS attack? Explain in detail. [10]**
b Write a note on Intellectual Property Aspects in cyber law. [10]
- 5 a Explain the objectives and features of IT Act 2000 [10]**
b What are Botnets? How it is exploit by attacker to cause cyber attack? [10]
- 6 a Explain SQL injection attack. State different countermeasure to prevent the attack. [10]**
b Explain what is Information Security Standard and Explain HIPAA act in detail [10]

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Note:

1. Question No. 1 is compulsory.
2. Attempt any **THREE** out of the remaining **FIVE** questions.
3. Assume suitable data if necessary.

- 1 Answer the following (any 4) (20)
- a) Define the terms: Hazard, Vulnerability, Risk 5
 - b) Discuss the Direct and indirect effects of disasters 5
 - c) What is Disaster Scenario of India? 5
 - d) Explain types of Manmade disasters. 5
 - e) What is Climate Change? What are the effects of Global Warming? 5
- 2
- a) What are different types of flood? Enlist structural mitigation measures for flood. 10
 - b) Explain the types of landslide and factors affecting them. Give a case study for the same. 10
- 3
- a) What are different government agencies responsible for various types of disasters? 10
 - b) Explain roles and responsibilities of NDMA in detail. 10
- 4
- a) Discuss the role of GIS and Remote Sensing in disaster management. 10
 - b) Describe the institutional mechanism setup in India. 10
- 5
- a) What is role of NGOs in disaster management? Enlist major NGOs working on disaster management. 10
 - b) Explain Bio shield and Sea wall in detail with schematic diagram. 10
- 6
- a) What is Community Base Disaster Management (CBDM)? Discuss how it is useful in Indian scenario. 10
 - b) What are Do's and don'ts in Earthquake, Tsunami and Cyclone? 10
