

(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**

Time: 3 Hours

Marks : 80

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?

Time: 3 Hours

Max Marks:80

- 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**

Time: 3 Hours

Max Marks:80

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

- Q1 Solve any four questions 20
- A. Role of science & Technology in Sustainable design of products
 - B. Simultaneous engineering
 - C. Explain Product design for Environment.
 - D. What is PLM? State its need and scope and phases.
 - E. What is digital mockup? State its benefits and list software used for it.
- Q.2 A. What do you mean by Design for X. How will you use design for X tools in the design process? 20
- B. Explain useful life extension strategies.
- Q.3 A. Explain the general framework of LCCA. 20
- B. What is sustainable development? Explain role of science & technology in it.
- Q.4 A. Discuss new product development process 20
- B. Explain cost analysis and life cycle approach in detail.
- Q.5 A. Explain the strategies for recovery at the end-of-life cycle 20
- B. What is the virtual product development process? Write its applications and advantages.
- Q.6 A. Explain the product life cycle in detail with suitable example 20
- B. Explain various reasons for implementation of PDM system. Explain various barriers for PDM implementation

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 %.
