

Time: 3 Hours

Marks: 80

- Question 1 is compulsory.
- Attempt any three questions from remaining.
- Design data book PSG, Mahadevan, Kale and Khandare are permitted to use.

Q1. Answer any four from the following.

- a) What do you mean by morphology of mechanical design? Explain any three phases of it. 5
- b) What are the different types of piston rings? Explain the function of them. 5
- c) Why cleaning of belt is necessary in belt conveyor? list down different types of cleaners. 5
- d) Draw a neat sketch of centrifugal pump and explain its principle of working? 5
- e) State the assumptions made in Lewis's bending strength equation and its significance. 5

Q2. A single stage helical gear box is used to transmit 12.5 kw power at 1440 rpm of pinion. The desire transmission ratio is 5:1. Assume 20-degree FD tooth profile and material C50 for pinion and gear.

- a) Determine the module. 5
- b) Check gear for dynamic load. 5
- c) Check gear for contact stresses. 5
- d) Determine the gear teeth proportions and write constructional details. 5

Q3. The following specification refers to an EOT crane. (20 Marks)

Application - Class II
 load to be lifted - 100 KN
 Hoisting Speed - 10 m/min
 Maximum lift – 5 m

- a) Design 6*37 type of rope and find its life. 5
- b) Select a standard hook, material and design stresses induced at the most critical section. 5
- c) Select suitable motor for hoisting. 5
- d) Design the rope drum. 5

- Q4 a) Define Lead, Lead Angle, Normal pitch and Helix angle with respect to the worm gearing. 5

- Q 4 b) The specification of belt conveyer system are
 Capacity = 300 TPH,
 Material to be conveyed = Lime stone,
 Maximum lump size = 80 mm,
 Inclination = 12°,
 Center to Center distance = 50 m,
 Troughing angle 25°,
 I. Design conveyor belt. 10
 II. Find motor capacity 5
- Q5.a) A centrifugal pump directly coupled to a motor is required to deliver 1000 LPM of water at 30 degree C against a total head of 25 m.
 I. Select the suitable type of motor power and speed. 5
 II. Determine the impeller diameter, inlet and outlet vane angles and no. of vanes. 5
- Q5. b) A Gear pump required to deliver 25 LPM of SAE20 oil at a pressure of 25 bar. Efficiency of the gear pump is 80 %.
 I. Select suitable standard motor. 5
 II. Design gear and check for bending failure. 5
- Q6. a) Explain why an I – section with $I_{xx} \leq 4 I_{yy}$ is selected for connecting rods of an I.C. Engine? 5
- Q6. b) A four-stroke single cylinder water cooled Diesel engine develops 7.5 KW brake power when operating at 1000rpm.
 I. Determine the bore and stroke of a cylinder. 5
 II. Design wet liner. 5
 III. Design piston with pin and piston rings. 5

3 Hours

80 Marks

1. Question no. 1 compulsory.
2. Answer any three questions out of remaining five
3. Attempt sub questions in order
4. Figures to the right indicate full marks.

1. Write short notes on (any 4) [20]
 - a) Capacity building
 - b) Functions of NIDM
 - c) Sea walls, embankments and bio shields
 - d) Triage
 - e) Environmental hazard
 - f) National Disaster Management Policy
 - g) Community based disaster preparedness
2. a) Discuss the framework for disaster management in India. [8]
2. b) Explain global warming and climate change. [6]
2. c) Comment on radiation hazards. Also discuss possibilities of chemical spills in Mumbai. [6]
3. a) Discuss the various types of technological disasters and highlight the specific efforts to mitigate such disasters in India. [8]
3. b) Explain the role of various international agencies for Disaster Management. [6]
3. c) Explain various means of raising finance for mitigating and managing disasters [6]
4. a) Differentiate between structural and non-structural measures of flood mitigation and discuss the importance of forecasting, warning and monitoring system in India [8]
4. b) Appraise the role of GIS and GPS in disaster management [6]
4. c) Discuss various types of natural disasters in India and highlight their impacts on life. [6]
5. a) Explain in detail the design concepts involved in as well as the construction materials used for the safe construction of facilities in case of earthquakes and cyclones. Also discuss the fire resistant facilities that need to be essentially provided in a building/industry. [8]
5. b) Elaborate the guidelines laid down by NDMA for disaster management in India. [6]
5. c) Explain in detail, vulnerability, with reference to floods and cyclones. List down the preparatory measures for minimizing vulnerabilities related to Tsunami. [6]

6. a) Discuss in brief the Disaster Management Act 2005. **[6]**
6. b) Explain Community based disaster preparedness **[5]**
6. c) Is rapid depletion of ground water a type of disaster? To which category does this belongs?
What are the reasons for this problem? **[5]**
6. d) Identify and discuss the various hazards which are associated with volcanic eruptions **[4]**
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Time: 3 Hours

Max. Marks: 80

- Note: 1. **Q1 is compulsory**
 2. Solve any three from remaining.
 3. Assume suitable data if necessary
 4. Figures to the right indicate full marks

- Q1. Solve any Four** **20**
- A State advantages of condition-based monitoring.
 B Explain piezoelectric accelerometer.
 C Define averaging
 D Define natural frequency and resonance.
 E State different application of laser doppler vibrometry.
 F Explain soft foot condition.
- Q2.**
- A Explain working and constructional details of a laser doppler vibrometer. **10**
 B Describe Fast Fourier Transform (FFT) with its advantages and disadvantages. **10**
- Q3.**
- A Explain unbalance in detail, its causes and step by step balancing procedure with the help of vector diagram. **10**
 B Explain classification of signals in data acquisition and signal processing. **10**
- Q4.**
- A Explain misalignment and its different types with unique vibration characteristics. **10**
 B Explain in detail faults related to gears. **10**
- Q5.**
- A Explain different faults associated with rolling element bearing with their unique vibration characteristics. **10**
 B Elaborate case study of sugar mill condition monitoring in detail. **5**
 C Differentiate time domain and frequency domain analysis **5**
- Q 6.**
- A Elaborate case study of turbine problem from sensor selection and mounting, measurement, plot, and fault identification. **10**
 B Explain spectral amplitude scaling with scale up and scale down operation. **5**
 C Explain criteria for selection of sensor. **5**

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** Solve any four **20**
- a** State the role of non-conventional energy sources in the current energy scenario of the India.
 - b** Discuss the I-V characteristics of a solar PV cell.
 - c** Illustrate the working principle of liquid dominated geothermal power plant.
 - d** State the factors considered for site selection to install wind power plant.
 - e** Define the following angles with a neat sketch,
 - i. Zenith angle
 - ii. Surface azimuth angle
 - iii. Latitude angle
 - iv. Solar declination angle
- 2 a** Illustrate the working principle of KVIC biogas plant with the neat sketch. **10**
- b** Determine the Local Solar time and declination at a location latitude $23^{\circ} 15' N$, longitude $77^{\circ} 30' E$ at 12.30 IST on Sep. 28. Equation of time correction is given from table or chart = $-(1^m 01^{s})$. **10**
- 3 a** Discuss types of fuel cells briefly. **10**
- b** Solar thermal power plant system installation is expected to minimize the plant's annual energy bill by Rs. 14 lacs. If the capital cost of new solar thermal power plant installation is Rs. 89 lacs and the annual operating and maintenance cost is 5 lacs. Determine, **10**
- (a) The expected payback period for the proposed project.
 - (b) The initial rate of return / return on investment.
- 4 a** Show that the ideal maximum theoretical efficiency is 59% (Bet'z coefficient) for a horizontal axis wind turbine. **10**
- b** Illustrate the working principle of ocean thermal energy conversion (OTEC) system with the neat sketch. **5**
- c** Classify the types of energy audit processes. **5**

- 5 a Describe the following briefly, 10
- (i) Factors affects the efficiency of PV cells and
 - (ii) Factors affects the Life cycle of solar PV cell.
- b Following data is given for a family biogas digester; 10
C.V. of methane = 25 MJ/m³, Burner efficiency = 55 %, Number of cows = 7,
Retention period = 27 days, Temperature of fermentation = 30⁰C, Day matter
collected/cow/day = 1.5 kg, Density of matter in the fluid in the digester = 50
kg/m³, Biogas yield=0.25 m³/ kg of dry input, Methane production in Biogas =
0.8.
Determine volume of Digester and power available from biogas digester.
- 6 a Describe the solar space heating and cooling. 10
- b Differentiate between the vertical and horizontal axis wind turbine. 5
- c Describe the working principle of Solar PV cells. 5

(Three Hours)

Total Marks: 80

Instructions:

- Q. 1 is compulsory.
- Attempt any THREE questions from the remaining questions
- Assume suitable data wherever necessary
- Draw figures wherever required
- Figures to the right indicate full marks.
- Non programable calculators are permitted.

- Q.1 Write short notes on. (Any Four). 20**
- a. What is the SCOR model? Why is it needed?
 - b. Why is Reverse Logistics (RL) needed?
 - c. Concept of Green Supply Chain Management (GSCM)?
 - d. Describe the role of RFID in warehouse management.
 - e. Explain in brief: lead-time, takt-time and cycle-time.
 - f. Types of risks in supply chains.
- Q.2 a. Define Global Supply Chain. What are the various challenges in establishing a global supply chain? 10**
- b. Discuss how to create a supplier score card in supply chain performance. 10**
Who use the score card?
- Q.3 a. What is meant by Bullwhip Effect? How is it caused? What measures can be taken to reduce the Bullwhip Effect? 10**
- b. Suppose that the annual requirement of a particular raw material item is expressed as 2,000 units per week. The existing policy of the company is to order the item in lots of 10,000 units which gets replenished the instant the order is placed. Subsequently, the company comes to know about the concept of EOQ. 10**
- Holding cost = Rs. 0.8/unit/year
Ordering cost = Rs. 20/order
- Determine for both the scenarios, the following:
1. Quantity to be ordered at a time.
 2. The total incremental cost.
 3. The number of orders placed per year.
 4. The time interval between two consecutive orders.
 5. Should the company continue to place orders in lots of 10,000 units?

- Q.4 a.** Compare 3PL and 4PL service providers. **05**
- b.** What is a Capacitated Vehicle Routing Problem (CVRP)? **05**
- c.** What is meant by Containerization? What are its different types? State advantages of containerization? **10**
- Q.5 a.** A television company works 5 days a week with 3 shifts a day. Each shift is 480 min. the break for lunch is 30 min. in the period of 9 weeks the customers' request is 4338 televisions. Calculate the takt time in the period. **05**
- b.** How do RFID and Bar Code technology differ? **05**
- c.** Define Distribution Network Design. Compare the various design options for Distribution Networks. **10**
- Q.6 a.** Explain Transport Management System (TMS)? What are the benefits of a Transport Management System (TMS)? **10**
- b.** Define and explain Cross-docking concept with a neat sketch. Mention its advantages and disadvantages. **10**
