Paper / Subject Code: 42871 / Design of Mechanical Systems

Prog. Code: 1T01437

(3 Hours) [Total 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

Q 1   Answer any **Four** from the following

a)	What is a bend in a rope pulley hoisting system? How does it affect rope life?	5
b)	Illustrate the design morphology process using a flowchart and relevant examples.	5
c)	Why does cavitation occur in a centrifugal pump? Suggest suitable remedial measures.	5
d)	What is piston ovality? Explain with the help of a neat diagram.	5
e)	Derive the expression for hydraulic force developed in a gear pump.	5

Q 2 (a)   Select a suitable 6×37 wire rope for a 150kN hoisting load and estimate its service life.   10

     (b)   Select a suitable hook with trapezoidal cross section and check it at most critical cross   10
section for design hoisting load of 50kN. Also select the suitable thrust bearing for it.

Q 3 (a)   Briefly explain belt construction and materials used.   5

     (b)   Determine the width of the conveyor belt and motor capacity for the following specification   15
Material to be conveyed   : Gravel
Capacity   : 100 TPH
Inclination   : 10 degree
Centre to Centre distance   : 50 m

Q 4 (a)   What is the most cost-effective cross-section for a connecting rod, and why?   5

     (b)   Determine bore diameter and design a piston for a 4-stroke, single cylinder, water cooled,   15
vertical petrol engine with following specifications:
Indicated power = 15 kW
Speed = 1200 rpm
Compression Ratio = 8

Q 5 (a)   Write short notes on various pressure angle systems used in gear design.   5
     (b)   Given the following specifications of a centrifugal pump,
        • Total manometric head: 20 m,
        • Discharge: 900 LPM,
        • Motor speed : 1440 rpm,
      i.   Required motor power   5
      ii.   Inlet and exit diameter of an impeller   5
      iii.   Number of impeller blades if inlet and exit angles are 20 and 25 degree respectively.   5

Q.6   A spur gear box is required to transmit 12 KW power from an electric motor rated at 1440
rpm with reduction ratio of 4.
      i.   Design a gear pair by selecting suitable material and design stresses.   10
      ii.   Check the gear for dynamic load and contact stresses.   10

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Paper / Subject Code: 42872 / Logistics and Supply Clain Management

exp code: 10080993

Time: 3 Hours

Max. Marks: 80

program code: IT01437

Note :
- **Question no.1 is compulsory.**
- Solve **any three** questions from the remaining five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

Marks

Q. 1		Solve **any four** of the following five questions (Each question carries 5 marks):	20
	a)	Summarize the concepts of Contract Management and Non-Disclosure agreement and their importance with the help of suitable examples.	
	b)	Explain the method of ABC analysis used for selective inventory control.	
	c)	Contrast the different types of transport methods used in Logistics.	
	d)	Differentiate between TMS and WMS with the help of diagram.	
	e)	List the six different types of distribution network designs and show their working with the help of neat sketches.	

Q. 2	a)	Illustrate the six stages of supply chain and show their contributions to increasing the value of the Supply Chain with the help of a neat diagram. Also show the importance of Money, Information and Material flow in a suitable Supply Chain case study.	10
	b)	Summarize the concept, causes and categories of Supply Chain Risk management in detail.	10

Q. 3	a)	Summarize the concept of Bullwhip effect and list the factors responsible for its reduction.	5
	b)	Define the concept of MOQ and list its benefits using suitable examples.	5
	c)	Summarize the concept of ABC analysis used for selective inventory control, using a suitable case study.	10

Q. 4	a)	Define outsourcing, list its types and explain and compare the 3PL and 4PL concepts in supply chain.	10
	b)	Differentiate between P system and Q system in inventory control.	5
	c)	A company has a demand of 12000 units per year for an item and it can produce the items at a unit cost of Rs. 120. The cost of one setup is Rs. 400 and the holding cost per unit per month is Rs. 0.15. Determine the optimum lot size and total cost per year.	5

Q. 5	a)	Define CSR and recall the initiatives and actions done under CSR.	10
	b)	List the different mathematical models used in SCM and recall their important points.	10

Q. 6	a)	List the Key issues in SCM and explain the four process cycles of Supply Chain using neat sketches.	10
	b)	Summarize the Role of IT in a supply chain.	10

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Paper / Subject Code: 42874 / Renewable Energy Systems (DLOC - III)

Prog Code: IT01437
QP Code: 100 69679

Duration: 3hours   [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.
        (3) Assume suitable data, if required and state it clearly.

1   Solve any four (all questions carry equal marks)   [20]
    a   State the current role of non-conventional energy sources to fulfill energy requirement of   [5]
        state the Maharashtra.
    b   Define the following angles with a neat sketch   [5]
        (i) Surface azimuth angle   (ii) Zenith angle
        (iii) Solar declination angle   (iv) Solar altitude angle
    c   Explain the working principle of Ocean Thermal Energy Conversion (OTEC) system.   [5]
    d   Describe the working principle of horizontal axis wind turbine with a neat sketch.   [5]
    e   State the working principle of Solar Photovoltaics.   [5]

2   a   State Betz coefficient and derive the ideal maximum theoretical efficiency equation for   [10]
        the horizontal axis wind turbine.
    b   Estimate the average global radiation falling on a horizontal surface at Nagpur ($21^\circ 15'$ [10]
        N, $79^\circ 09'$ E) during month of 16th March if the average sunshine hours per day is 9.2.
        Assume values for a=0.27 and b=0.50.

3   a   Explain the parameters which affects the rate of biogas production.   [8]
    b   Describe the working principle of oscillating water column wave energy system.   [6]
    c   Discuss the I-V characteristics of a solar PV cell with a neat sketch.   [6]

4   a   Explain the types of Fuel cells.   [10]
    b   A system-A, which consumes 81 kW of electric energy and its cost is Rs. 28,000/- while   [10]
        the System-B consumes 78 kW of energy and its cost is Rs. 32,0000/-. Both the systems
        run 1800 hrs a year and the cost of electric energy is Rs. 5 per kWh. Which system will
        be cheaper if a discount rate of 12% is considered when a life of 15 years is taken?

5   a   Following data is given for a family biogas digester;   [10]
        C.V. of methane = 24 MJ/m^3, Burner efficiency = 60 %, Number of cows = 4, Retention
        period = 30 days, Temperature of fermentation = 32^0C, Day matter collected/cow/day =
        3 kg, Density of matter in the fluid in the digester = 50 kg/m^3 Biogas yield=0.27 m^3/ kg
        of dry input, Methane production in Biogas = 0.8.
        Determine volume of Digester and power available from biogas digester.
    b   State the significance of solar space heating and cooling.   [5]
    c   Classify the types of energy audit processes   [5]

6 a Explain the working principle of following solar thermal devices with a neat sketch   [10]
       (i) Solar Pond
       (ii) Solar Distillation unit
   b State the significance of Green Building.   [5]
   c Explain the working principle of Savonius vertical axis wind turbine.   [5]