5TH SEM./ COMMON / 2022(W)

Th-1 ENTREPRENEURSHIP AND MANAGEMENT & SMART TECHNOLOGY

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right-hand margin indicates marks.

1.		Answer **All** questions	2 x 10
	a.	Name two barriers in entrepreneurship.	2
	b.	Write two advantages of preliminary project report.	2
	c.	Write two techniques /models of inventory management.	2
	d.	How does branding helps manufacturers, retailer and consumers?	2
	e.	Name two symptoms of bad management.	2
	f.	Write two primary responsibilities of Human Resource Department in an industry.	2
	g.	Write two functions of a leader.	2
	h.	Name four personal protective equipment used in industry.	2
	i.	Write two applications of break-even analysis.	2
	j.	Write two applications of smart agriculture.	2
2.		Answer **Any Six** Questions	6 x 5
	a.	Compare between an entrepreneur and manager	5
	b.	Write a short note on a successful Indian Entrepreneur. Mention any five quality in him/her.	5
	c.	Explain the role of District Industry Center in promoting enterprises. List any five supports provided by DIC to entrepreneur.	5
	d.	What are the parameters used to decide the plant capacity in a project?	5
	e.	What is TQM? Explain the need of TQM in small enterprises.	5
	f.	Write any five safety provisions in Factory Act,1948?	5
	g	Explain the techniques of motivation.	5
3		a. What is Technology Business Incubator? Explain with example. b. Explain the success story of an Indian start up.	10
4		Explain the components of Techno economic feasibility report.	10
5		Explain delivery schedule, market need and inventory control in production planning and control.	10
6		Write the Concept of IoT and how does it work.	10
7		Explain the management of working capital	10

5TH SEM./ DIP. IN MECH./ MECH(MAINT)/ MECH(PROD)/ MECH(SAND)/ MECHANICAL/ MECH(IND. INT) / 2022(W)

Th2 Design of Machine Elements

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks
DATA BOOKS ALLOWED

1. Answer **All** questions 2 x 10
   a. What is meant by Spring Rate and Pitch?
   b. Define the term: Factor of Safety.
   c. What is Modulus of Rigidity?
   d. What are the different types of keys?
   e. What is rivet? State its uses.
   f. Define welding and types of welding process.
   g. What is the pressure vessel?
   h. What is spring? Classify spring into its various types.
   i. State the formula for stress in helical spring of a circular wire.
   j. State four general considerations in Machine design.

2. Answer **Any Six** Questions 6 x 5
   a. What is the function of shaft coupling? Describe requirements of a good shaft coupling.
   b. Explain the failures of a riveted joint.
   c. Describe the mechanical properties of the material.
   d. Two plates of 10mm thickness each are to be joined by means of a single riveted double strap butt joint. Determine the rivet diameter, rivet pitch, strap thickness of the joint. Take the working stresses intension and shearing as 8MPa and 60MPa respectively.
   e. A line shaft rotating at 200 rpm is to transmit 20kW. The shaft may be assumed to be made of mild steel with an allowable shear stress of 42MPa. Determine the diameter of the shaft neglecting the bending moment on the shaft.
   f. Briefly explain the advantages and disadvantages of Welded Joints over Riveted Joints.
   g State the application of Saddle keys, Tangent keys, Round keys, Splines keys and Woodruff keys with neat sketches.

3	Design and make a neat dimensioned sketch of a muff coupling which is used to connect two steel shafts transmitting 40kW at 350 rpm. The material for the shafts and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40MPa and 80MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15MPa.	10
4	Design a close coiled helical compression spring for a service load ranging from 2250N to 2750N. The axial deflection of the spring for the load range is 6mm. Assume a spring index of 5. The permissible shear stress intensity is 420MPa and modulus of rigidity $G=84kN/mm^2$. Neglect the effect of shear concentration. Draw a fully dimensioned sketch of the spring showing details of the finish of the end coils.	10
5	Write down the general Procedure followed in Machine Design.	10
6	A plate 100mm wide and 12.5mm thick is to be welded to another plate by means of parallel fillet welds. The plates are subjected to a load of 50kN. Find the length of the weld so that the maximum stress does not exceed 56MPa. Consider the joint first under static loading and then under fatigue loading.	10
7	Design the rectangular key for a shaft of 50mm diameter. The shearing and crushing stresses for the key material are 42MPa and 70MPa.	10

5TH SEM./ DIP. MECH /MECH(MAINT.)/MECH(PROD.)/ MECH(SAND) MECHANICAL/ MECH. ENGG(IND. INT.)/ 2022(W)

Th-3 Hydraulic Machines & Industrial Fluid Power

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

a. Classify turbines.

b. Define a Pneumatic system.

c. What is the function of a turbine?

d. Define mechanical efficiency of a pump.

e. What do you understand by negative slip in a reciprocating pump?

f. Define hydraulic efficiency of a turbine.

g. Name the following components used in a pneumatic circuit

i) ii)

h. Name four important components of a hydraulic system.

i. Define a pump. Classify it.

j. Define fluid power.

2. Answer **Any Six** Questions 6 x 5

a. Discuss about the direct control of single acting cylinders.

b. Compare impulse turbine with reaction turbine.

c. Write down the Operation of Double Acting Cylinder with metering in control with sketch.

d. Why priming is necessary in a Centrifugal Pump?

e. Compare Hydraulic systems with pneumatic systems.

f. Derive the expression for discharge through a Single Acting Reciprocating Pump and work done by it.

g Discuss about 3/2 Directional Control Valves used in hydraulic circuit.

3 A single acting reciprocating pump, running at 50 rpm, delivers 0.015 m^3/s of water. The diameter of the piston is 180 mm and stroke length 350 rpm. Determine the a) Theoretical discharge of the pump, b) Co-efficient of discharge and c) Slip and the percentage slip of the pump. 10

4 Discuss briefly about various components of a pneumatic control system. 10

5 Discuss about internal and external gear pumps used in hydraulic systems with neat sketch. 10

6 A Pelton wheel has a mean bucket speed of 8 m/s with a jet of water flowing at the rate of 650 lit/s under a head of 25 meters. The buckets deflect the jet through an angle of 160°. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.97. 10

7 Write short notes on: 10
a) Cavitation
b)Throttle Valve
c) Draft Tube in turbine
d) Hydraulic Accumulator

5TH SEM./ AUTO/DIP MECH ENGG/ MECH(MAINT) /MECH(PROD) /MECH(SAND)/MECH(IND.INT) /MECHANICAL / 2022(W)

Th4 Mechatronics

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
   a. Define Mechatronics.
   b. State the various applications of Mechatronics.
   c. List the various types of the mechanical actuators.
   d. Write down the advantages of PLC.
   e. Define and classify transducer.
   f. What is meant by mnemonics?
   g. State the uses of PLC.
   h. State the functions of robotics.
   i. Write down the advantages and disadvantages of robots.
   j. State the uses of worm gear?

2. Answer **Any Six** Questions 6 x 5
   a. List the components of a mechatronic system and explain their functions.
   b. Define sensor and explain the working of motion sensor.
   c. Explain the working of solenoid.
   d. Discuss the working of master and jump controller.
   e. Explain the software and hardware components of CAD/CAM.
   f. Write down the difference between switches and relays.
   g Discuss the laws of robotics.

3 Describe in details the architecture of PLC with a neat diagram. 10

4 Give a detailed classification of Industrial Robots. 10

5 Write short note on: 10
   1) Light sensor
   2) Stepper motor

6 What is meant by drives in CNC? Explain the different types of drives present in CNC machine. 10

7 What are the different types of electromechanical transducer? Discuss in details. 10

5TH SEM /MECHANICAL/ MECH(MAIN)/ MECH(PROD)/ MECH(SAND) / DIP IN MECH/ MECH(INDUSTRY INTEGRATION)/ 2022(W)

TH-5 Refrigeration & Air Conditioning

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks
PSYCHOMETRICS CHARTS ALLOWED

1. Answer **All** questions 2 x 10
   a. What is sensible heat factor?
   b. Discuss about closed system Brayton Cycle.
   c. State the unit of refrigerating effect.
   d. What is saturated air?
   e. How does an air filter work?
   f. Define refrigeration.
   g. What is moist air?
   h. What is humidity ratio?
   i. What do you understand by human comfort?
   j. Why a comfort chart is recommended?

2. Answer **Any Six** Questions 6 x 5
   a. What do you mean by wet bulb temperature? Explain how it is different from dew point temperature.
   b. Describe different components of a simple vapour compression refrigeration system.
   c. Classify air-conditioning system.
   d. Discuss in brief about the filters and fans used in air-conditioning system.
   e. Air at 40^0C has a relative humidity of 98%. What is dew point temperature? What mass of liquid water per kg of dry air will result if the moisture is cooled to 8^0C at constant pressure of 85KPa.
   f. State the factors considered while selection of a refrigerant for a system.
   g Differentiate between summer air-conditioning system and winter air-conditioning system

3 Explain briefly with a neat diagram the working of a practical vapour absorption system. 10

4 1kg of air at a pressure of 1.2bar and a temperature of 18^0C is compressed to 5.5bar. It is then cooled to 25^0C in the cooler before entering the expansion cylinder. Assuming compression and expansion as isentropic processes, determine the refrigerating effect per kg of air and theoretical COP. Take C_p = 1.0 & γ=1.4. 10

5 Describe in detail the summer air conditioning system with neat sketch. 10

6 How the load for air-conditioning is calculated? What are the factors which are to be considered while evaluating the heat gains? 10

7 A sling psychrometer recorded WBT and DBT as 22^0C and 28^0C. Calculate the Vapour Pressure, Degree of saturation, Relative humidity and Specific humidity. 10