5th Sem. COMMON 2020(W)

Th1- Entrepreneurship and Management & Smart Technology

Full Marks: 80   Time- 3 Hrs

Answer the questions as per the instruction.
Figures in the right hand margin indicates marks

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

   a.   Write the full form of NABARD.

   b.   Enlist at least four characteristics of an entrepreneur.

   c.   Why should an entrepreneur prepare the project himself?

   d.   Define financial management.

   e.   Distinguish between debit and credit.

   f.   Define market.

   g.   Why does an organization need advertisement?

   h.   Differentiate a manager with a leader.

   i.   Define IoT.

   j.   Define IPR (Intellectual Property Right).

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

   a.   Differentiate entrepreneur with manager.

   b.   What are the factors to be taken into account to select a technology
        for an enterprise?

   c.   Write the objectives of financial management.

   d.   Write the different functions of marketing.

   e.   Briefly discuss different types advertising media.

   f.   Briefly explain the functions of HRM.

   g.   Briefly discuss the smart transportation system, the advantages and

disadvantages related to it.

h. Explain the Maslow's theory of motivation.

3   Answer any three questions   10x3

a. Briefly explain different barriers in entrepreneurship.

b. How do you select a business opportunity? Explain different components (at least five) related to business opportunity.

c. What is PPR (Preliminary Project Report)? Briefly explain the structure of PPR.

d. Explain the five functions of management briefly.

e. Briefly explain the general recruitment process in an organization.

f. Briefly explain different types of budgets.

5TH SEM/MECH/MECH(MAIN.)/MECH.(PROD.)/MECH(IND.INT)/ MECH(SAND)/ 2020(W)NEW
Th-2 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

1. **Answer All questions**   **2 x 10**
   a. Define factor of safety
   b. State function of shaft.
   c. What is a key? State its function.
   d. What are the materials used for helical spring?
   e. What is modulus of rigidity?
   f. What is surge in springs?
   g. What is the difference between toughness and stiffness?
   h. What are the different types of shaft couplings?
   i. Define Diagonal pitch.
   j. What is welded joint? Write two application of welded joint.

2. **Answer Any Six Questions**   **6 x 5**
   a. What are the advantages of welded joint over riveted joints?
   b. Explain mechanical properties of the material.
   c. Draw stress-strain diagram for mild-steel. Explain various points.
   d. Explain the failures of a riveted joint.
   e. 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.
   f. How are the keys classified? Draw neat sketches of different types of keys and state their applications.
   g. A line shaft rotating at 200r.p.m 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.

3 Design a clamp coupling to transmit 30kW at 100r.p.m The allowable shear stress for the shaft and key is 40mPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is 70mPa. The co-efficient of friction between the muff and the shaft surface may be taken as 0.3.   **10**

4 Describe the Design procedure in details.   **10**

5 A helical spring is made from a wire of 6mm diameter and has outside diameter of 75mm. If the permissible shear stress is 350mpa and modulus of rigidity 84kN/mm². Find the axial load which the spring can carry and the deflection per active turn.   **10**

6 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 and efficiency of the joint. Take the working stresses in tension and shearing as 80mPa and 60mPa respectively.   **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**

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. Write down the definition of hydraulic turbine and give one example.
   b. What is the mathematical formula for hydraulic efficiency of Francis turbine?
   c. Write the formula for speed ratio of Kaplan turbine.
   d. Define about suction lift and delivery lift for centrifugal pump.
   e. Define about hydraulic pump.
   f. Define positive slip and negative slip for reciprocating hydraulic pump.
   g. Why air regulator is used in the pneumatic control system?
   h. What is the function of flow control valve in pneumatics?
   i. Write the purpose of using actuators in hydraulic control system.
   j. Draw symbols for bi-directional motor and check valve of hydraulic control.

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

   a. Distinguish between impulse and reaction turbine.
   b. Write a short note about working of centrifugal hydraulic pump.
   c. A single acting reciprocating pump running at 100 rpm delivers 0.012 m^3/sec of water. The diameter and stroke of the cylinder are 0.2 m and 0.3 m respectively. Calculate the coefficient of discharge and percentage of slip.
   d. Explain briefly about air lubricator.
   e. Write down short note on single-acting cylinder for pneumatic control.
   f. Write about the advantages and limitations of hydraulic system.
   g. Write briefly about direct acting relief valve.

3	The mean bucket speed of a pelton wheel is 10 m/s. Jet of water flows at the rate of 0.8 m^3/sec under a head of 35m. The buckets deflect the jet through an angle of 165^0. If the coefficient of velocity of the jet is 0.98, then find power developed by water in the turbine and hydraulic efficiency of turbine.	10
4	Find the manometric efficiency and vane angle at inlet of a centrifugal pump delivering water at the rate of 0.2 m^3/s against a total head of 80m. The pump runs at 1450 rpm. The inner and outer diameter of the pump are 25 cm and 50 cm respectively. The area of flow through the impeller is $0.08m^2$. The vanes are curved in backward direction at an angle of 30^0 at exit.	10
5	Explain in detail about construction and working of double acting reciprocating pump with neat sketch.	10
6	Explain in detail about 3/2 DCV and 5/2 DCV with proper diagrams for pneumatic control systems.	10
7	Explain about external and internal gear pumps used in hydraulic controls.	10

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 x10
   a. Define Mechatronics.
   b. "The System Mechatronics" is employed with how many systems?
   c. What is thermocouple?
   d. Define kinematic link.
   e. Define sensor. State its advantages.
   f. What is meant by solenoid?
   g. State the function of an actuator.
   h. Define spur gear.
   i. Define relay.
   j. What is mnemonics?

2.   Answer **Any Six** Questions: 6 x 5
   a. Explain Mechatronics system and Measurement system with appropriate block diagram with advantages and disadvantages?
   b. Explain Electromechanical transducer with its application.
   c. Briefly describe about transducer actuating mechanism and various types of transducer.
   d. Explain briefly about light sensor, temperature sensor with a neat sketch.
   e. Give a brief description about Bolt and Belt drive mechanism.
   f. Explain different types of Industrial Robot.
   g Explain functioning of CAD/CAM system.

3   Explain briefly the Architecture basic internal structure of PLC and also the selection and use of PLC.   10

4   Classify the different types of Kinematic pair. Explain working principle of slider crank mechanism with neat sketch.   10

5   Calculate the velocity ratio and the output speed of the driver pulley on a lawn mower belt and pulley, where the input speed is 300rpm and diameter of driver pulley is 150mm and diameter of driven pulley is 15mm?   10

6   Explain Electrical Actuator and the working principle of Electrical solenoid Actuator with its application.   10

7   Write short notes on: 10
        a) Switches
        b) Guideways
        c) Spindle drive
        d) Master and Jump control
        e) DC motor

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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

1.   Answer **All** questions   2 x 10
   a.   What do you mean by refrigeration?

   b.   Define 'tonne' of refrigeration.

   c.   Differentiate between primary refrigerant and secondary refrigerant.

   d.   What are the chemical formulae of refrigerant R-11, R-13, R-21 and R-22?

   e.   What are the equipments used in an Air-conditioning system?

   f.   What is the use of Air filter and blower in air conditioning system?

   g.   Define sensible heat factor.

   h.   What is Dry-bulb temperature?

   i.   What are the physical properties of refrigerant?

   j.   Give the classification of evaporators.

2.   Answer **Any Six** Questions   6 x 5
   a.   Describe chemical properties of refrigerants.

   b.   With the help of neat diagram explain the working of a thermostatic expansion valve.

   c.   Enumerate the desirable properties of an ideal refrigerant.

   d.   With the help of Psychrometric chart, Explain sensible cooling and sensible heating.

   e.   Draw the P-V and T-S diagram for a reversed Brayton cycle and derive the expression for its COP.

   f.   What are the applications of refrigeration? Explain ice plant layout.

   g   In vapour absorption refrigeration system, heating, cooling and refrigeration take place at the temperatures of 100°c, 20°c and -5° respectively. Find the maximum C.O.P of the system.

3   With neat sketch, describe practical vapour absorption refrigeration   10
     system.

4   Explain in details about the summer air conditioning and winter air-   10
     conditioning system.

5   Explain with the help of neat sketch, the principle of operation of a   10
     single stage, single acting reciprocating compressor.

6   In an ammonia vapour compression system, the pressure in the   10
     evaporator is 2bar. Ammonia at exit is 0.85 dry and at entry its
     dryness fraction is 0.19. During compression the work done per kg of
     ammonia is 150kJ. Calculate the C.O.P. and the volume of vapour
     entering the compressor per minute. If the rate of ammonia
     circulation is 4.5kg/min. The latent heat and specific volume at 2bar
     are 1325kJ/kg and 0.58m^3/kg respectively.

7   In an absorption type refrigerator, the heat is supplied to NH_3 10
     generator by condensing steam at 2bar and 90% dry. The temperature
     in the refrigerator is to be maintained at -5°C.Find the maximum
     C.O.P. possible. If the refrigeration load is 20 tonnes and actual C.O.P.
     is 70% of the maximum C.O.P., Find the mass of steam required per
     hour. Take temperature of the atmosphere as 30°C.

TH-II 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.   Define working stress.

   b.   What is a key? State its function.

   c.   Define angle of twist.

   d.   What are the materials used for helical spring?

   e.   State materials for shaft.

   f.   What is welded joint ? Write two application of welded joints?

   g.   What are different types of rivet head.

   h.   What is surge in spring?

   i.   What is muff coupling?

   j.   What do you mean by SWG number? What is solid length of a spring.

2.   Answer **Any Six** Questions   6 x 5
   a.   Describe physical properties of the materials.
   b.   What are the advantages of welded joints over riveted joints?

   c.   Draw stress-strain diagram for mild steel. Explain various points.

   d.   What is a shaft? State its function. list the properties of a shaft materials.

   e.   Design the rectangular key for a shaft of 50mm diameter. The shearing and
        crushing stresses for the key material are 42mpa and 70mpa.

   f.   A plate 100mm wide and 12.5mm thick is to be welded to another plate by means
        of parallel fillet weds. 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.

   g   Describe the terms used in compression spring.

3   Describe Design procedure.   10

4   A closely coiled helical spring is made of 10mm diameter steel wire,the coil   10
        consisting of 10   complete turns with a mean diameter of 120mm, The spring
        carries an axial pull of 200N. Determine the shear-stress induced in the spring
        neglecting the effect of stress concentration. Determine also the deflection in the
        spring, its stiffness and strain energy stored by it if the modules of rigidity of the
        materials is 80 KN/mm^2.

5   A solid shaft is transmitting 1MW at 240r.p.m. determine the diameter of the   10
        shaft if the maximum torque transmitted exceeds the mean torque by 20%. Take
        the maximum allowable shears stress as 60Mpa.

6   Design a clamp coupling to transmit 30kw at 100r.p.m. The allowable shear   10
        stress for the shaft and key is 40Mpa and the number of bolts connecting the two
        halves are six. The permissible tensile stress for the bolts is 70Mpa. The
        coefficients of friction between the muff and the shaft surface may be taken as
        0.3.

7   Describe, with the help of neat sketches, the types of various shaft couplings 10
        mentioning the uses of each type.

TH-III **Hydraulic Machines and 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.   Define hydraulic machines.
   b.   What is slip in pump?
   c.   What is actuator?
   d.   Draw symbols for the following hydraulic components.
             I.   Pressure relief valve.   II.   Double acting cylinder.
   e.   Why and where filters are fitted in a hydraulic circuit?
   f.   Classify the turbines in terms of head of water available.
   g.   Write the expression for power required to drive a double-acting reciprocating pump.
   h.   Why air is preferred as the working medium in pneumatic pump.
   i.   Write the functions of throttle valves?
   j.   What are the functions of pressure control valves?

2.   Answer **Any Six** Questions   5X6
   a.   Give the comparison between impulse turbine and reaction turbine.
   b.   Explain the working of an external gear pump.
   c.   A single acting reciprocating pump running at 50r.p.m. delivers $0.00736 m^3$/sec of water. The diameter of the piston is 200mm and stroke length 300mm. The suction and delivery heads are 3.5m and 11.5m respectively. Determine
             I.   Theoretical discharge. II.Co-efficient of discharge.
             III. Percentage slip of the pump.
   d.   A pelton wheel having a mean bucket diameter of 1.2m is running at 1000r.p.m. The net head on the pelton wheel is 840m. If the side clearance angle is 15^0 and discharge through the nozzle is $0.12 m^3$/sec. Determine.
             I.   Power available at the nozzle and
             II.   Hydraulic efficiency of the turbine.
   e.   Write a suitable diagram explain main parts of a Kaplan turbine.
   f.   Write advantages and disadvantages of Francis turbine over a pelton wheel.
   g   Give the comparison between hydraulics and pneumatics drive systems.

3   What is directional control valve? Explain the working of 3/2 and 5/3 directional   10
      control valve.
4   Explain the working of single acting reciprocating pump.   10
5   Describe various efficiencies of a turbine.   10
6   A kalpan turbine develops 24647.6kw power at an average head of 39 meters.   10
      Assuming a speed ratio of 2. flow ratio of 0.6 diameter of the boss equal to 0.35
      times the diameter of the runner and an overall efficiency of 90%, calculate the
      diameter, speed and specific speed of the turbine.
7   A centrifugal pump is to discharge 0.118m3/sec at a speed of 1450rpm against a   10
      head of 25m.The impeller diameter is 250mm , its width at outlet is 50mm and
      manometric efficiency is 75% .Determine the vane angle at the outer periphery
      of the impeller.

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 the term "Mechatronics" and give two applications of Mechatronics system.
   b.   What is a transducer & classify them into its various types.

   c.   What is an actuator? List the various types of actuators.
   d.   What is a PLC? Mention its uses.
   e.   What do you mean by "Numerical Control"? Enumerate the various applications of NC machines.
   f.   State the functions of Robotics.
   g.   List the components of a Mechatronics system.
   h.   What is a displacement sensor and where it is used?
   i.   Define machine and mechanism.
   j.   Write down the basic components of a PLC.

2   Answer **Any Six** Questions   5x6
   a.   Explain in brief the advantages and disadvantages of Mechatronics.
   b.   What is temperature sensor and classify it? Discuss the different types of temperature sensor.
   c.   Explain the working of solenoid.
   d.   Explain briefly: (i) Mnemonics (ii)Jump Controller.
   e.   List the various features and applications of CAD/CAM.
   f.   Explain the differences between switches and relays.
   g   Define robotics. Explain the laws of robotics.

3   (a)Discuss the different types of sensors.   [6]   10
       (b)With neat diagram explain slider crank mechanism. [4]
4   (a)Explain briefly the AC motor & DC motor.   10
       (b)Write the advantages and disadvantages of robots.
5   With a neat diagram, explain the architecture of PLC.   10
6   (a)Explain briefly the hardware and the software components of   10
       CAD/CAM.   [6]
       (b)What are Spindle & feed drives? [4]
7   (a) Discuss the various types of industrial robots.   10
       (b)Write the difference between Stepper motor & Servomotor.

Th5 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

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

   a.   Define tonne of refrigeration.

   b.   What is the function of refrigerant?

   c.   Differentiate between open & closed air refrigeration system.

   d.   Draw schematic diagram of Bell-Coleman cycle.

   e.   Write the function of rectifier in VARS.

   f.   Why condenser is used in refrigeration cycle?

   g.   Write function of expansion valves with two examples.

   h.   What is the chemical formula of refrigerant dichloro-difluro
        methane?
   i.   Define relative humidity.

   j.   Write conditions of comfort air conditioning.

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

   a.   Compare between VCRS and VARS.

   b.   Explain working of single acting reciprocating air compressor with
        suitable diagram.
   c.   What should be the desirable properties of an ideal refrigerant?

   d.   Describe Winter Air Conditioning system.

   e.   Explain Shell and tube type evaporator.

   f.   Write about the factors affecting comfort air conditioning.

   g   In a refrigeration system working on Joule cycle, air is compressed to
        5bar from 7bar.Its initial temperature is 10°C.After compression, air
        is cooled upto 20°C in a cooler before expanding back to the
        pressure of 1 bar. Find COP of the system. Take C_P & C_v value for air
        as 1.005KJ/Kg-K & 0.718 KJ/Kg-K respectively.

3   Explain simple Vapour Absorption Refrigeration System with neat   10
       sketch.

4   A VCRS uses refrigerant R-40 and operates between temperature   10
       limits of -10°C & 45°C.At entry to the compressor, refrigerant is dry
       saturated & after compression it acquires a temperature of 60°C.
       Find COP of the refrigerating system. The properties of R-40 are

Temp in ^{o}C	h_f(KJ/Kg)	h_g(KJ/Kg)	S_f(KJ/Kg-k)	S_g(KJ/Kg-k)
-10	45.4	460.7	0.183	1.637
45	133	483.6	0.485	1.587

5   The atmospheric air at 25°C DBT and 12°C WBT is flowing at the rate   10
       of 100m^{3}/min through the duct. The dry saturated steam at 100°C is
       injected into the air stream at the rate of 72 Kg/Hour. Calculate
       specific humidity and enthalpy of the leaving air. Also determine
       DBT,WBT & relative humidity of leaving air.

6   Write short notes on   10
       a) Automatic Expansion Valve
       b)Cold storage plant

7   What is psychometric chart? write its uses. Explain different types of   10
       psychometric processes.

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.	10
	b. Explain the success story of an Indian start up.	
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

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   10
     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.

4   Design a close coiled helical compression spring for a service load   10
     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.

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   10
     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.

7   Design the rectangular key for a shaft of 50mm diameter. The   10
     shearing and crushing stresses for the key material are 42MPa and
     70MPa.

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 10
     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.

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

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

6   A Pelton wheel has a mean bucket speed of 8 m/s with a jet of 10
     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.

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   10
        CNC machine.
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