5TH SEM./ COMMON TO ALL/ 2023(W) NEW

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. What is entrepreneurship?
   b. What is start up ?
   c. What is project appraisal?
   d. List the components of project cost.
   e. Define management.
   f. Write the need of inventory management.
   g. List two barriers in business communication.
   h. Write two methods of maintaining relations with subordinates.
   i. What is trademark? Write two advantages of having trade marks.
   j. What is smart technology?

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

   a. Explain in brief the qualities of entrepreneur.
   b. What is Maslow theory of motivation. Explain.
   c. Explain SSI, Ancillary unit and Tiny units.
   d. Write a note on staffing as a function of management.
   e. Explain ABC Analysis (selective inventory control), a model of inventory managements.
   f. Write the components of IOT.
   g Explain different styles of leadership.
   h Write five points in payment of wages act.

3 Explain the assessment of demand and supply in potential area of growth. 10

4 Write the important functions of management. 10

5 Explain TQM concept-Quality Policy, Quality Management and quality system. 10

6 Explain the concept of 4Ps in marketing management. 10

7 Explain the application of IOT in smart healthcare and smart agriculture. 10

5TH SEM. / MECH./DIP. IN MECH./MECH(MAINT.)/MECH.(PROD.)/ MECH(SAND.)/MECH(IND.INT.)/2023(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 for ductile material.
   b. Define toughness and stiffness.
   c. What is key and key-way?
   d. What is spring rate and pitch?
   e. What is the difference between shaft and axle?
   f. What is caulking and Fullering?
   g. Define Rankine Theory.
   h. What are modes of failure of Riveted Joint?
   i. Define angle of twist.
   j. What is muff coupling?

2. Answer **Any Six** Questions 6 x 5
   a. What are the effects of key way in a shaft?
   b. Explain spring constant, spring index, Free length, solid length & pitch.
   c. What is shaft? State its function & list the properties of shaft material.
   d. Design the rectangular key for a shaft of 50mm diameter. The shearing and crushing stresses for the key material are 42MPa and 70 MPa respectively.
   e. Explain the mechanical properties of the material.
   f. Write a short note on Surge Spring.
   g What are the requirements of good shaft coupling?

3 A solid shaft is transmitting 1MW at 240 r.p.m. Determine the diameter of the shaft if the maximum torque transmitted exceeds the mean torque by 20%. Take the maximum allowable shear stress as 60 MPa. 10

4 Describe with the help of neat sketch, the types of various shaft coupling mentioning the uses of each type. 10

5 Determine the rivet diameter, rivet pitch, strap thickness & efficiency of a single riveted double strap butt joint. Here two plates of 10mm thickness each are to be joined. Take the working stress in tension & shearing as $80N/m^2$& 60 N/m^2 respectively. 10

6 Design completely a rectangular sunk key considering its failure against shear and crushing. 10

7 Derive the expression for stresses in helical spring of circular wire. 10

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Th-3 Hydraulic Machine & 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 Pump.
   b. What is the difference between axial flow and radial flow turbine?
   c. Write down the formula for speed ratio of Kaplan Turbine.
   d. What is directional control valve?
   e. Define Slip and Percentage Slip.
   f. Why air is preferred as the working medium in pneumatic pump?
   g. Define Manometric efficiency.
   h. What is an actuator?
   i. Draw the symbol for (i) Pressure relief valve (ii) Double acting cylinder
   j. Classify turbine in terms of head of water available.

2. Answer **Any Six** Questions 6 x 5
   a. Explain the working of external gear pump.
   b. What is centrifugal pump? Explain main parts of centrifugal pump with neat sketch.
   c. What are the advantages & disadvantages of Francis turbine over a Pelton turbine?
   d. Compare Centrifugal pump with Reciprocating pump.
   e. Derive the expression for discharge through a double acting reciprocating pump.
   f. Write down the merits and demerits of pneumatic system.
   g Describe the working Pelton Turbine.

3 Explain the working of direct control of single acting cylinder pneumatic circuit with neat sketch. 10

4 Discuss about 5/2 directional control valve used in pneumatic circuit. 10

5 A single-acting reciprocating pump, running at 50r.p.m. delivers $0.01m^3/s$ of water. The diameter of the piston is 200mm & stroke length 400mm. Determine (i) the theoretical discharge of the pump (ii) Co-efficient of discharge (iii) Slip & % slip of the pump. 10

6 The internal and external diameters of the impeller of a centrifugal pump are 200mm & 400mm respectively. The pump is running at 1200 r.p.m. The vane angle of the impeller at inlet and outlet are 20^0 and 30^0 respectively. The water enters the impeller racially and velocity of flow is constant. Determine work done by the impeller per unit weight of water. 10

7 A Pelton turbine is having a mean bucket diameter of 1m & running at 1000 r.p.m. The net head on the Pelton turbine is 700m. If the side clearance angle is 15^0 & discharge through the nozzle is $0.1m^3/s$. Find the power available at the nozzle & hydraulic efficiency of turbine. 10

5TH SEM./ MECH./AUTO / DIP.IN MECH./ MECH(MAIN)/ MECH(PROD.) / MECH(SAND.)/MECH(IND. INT.)/ 2023(W) NEW

Th-4 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 and classify transducer.
   b. What are the applications of Industrial robots?
   c. What is an actuator? List the various types of actuators.
   d. What do you mean by Numerical control? Enumerate various applications of NC machines.
   e. List the components of a mechatronic system.
   f. State the functions of robotics.
   g. Write down the basic components of CNC machine tool.
   h. What is a displacement sensor and where it is used?
   i. Define machine and mechanism.
   j. What is a PLC? Mention its uses.

2. Answer **Any Six** Questions 6 x 5
   a. Discuss the various features and applications of CAD/CAM.
   b. What is mechatronics? Write down the advantages and disadvantages of mechatronics.
   c. Explain the fixed zero and flow zero method for specifying the origin of coordinate system in NC machine.
   d. What is temperature sensor? Give a brief classification of the different types of temperature sensor.
   e. Write the differences between switches and relays.
   f. Write a short note on Solenoids.
   g Define robotics. Explain the laws of robotics.

Answer Any **Three** Questions

3 (a) Discuss the different types of sensors. 10
(b) Write the difference between Stepper motor & Servomotor.

4 (a) Discuss various types of industrial robots? 10
(b) Write the advantages and disadvantages of robots.

5 With neat diagram explain the architecture of PLC. 10

6 (a) Briefly explain the hardware and the software components of CAD/CAM. 10
(b) What are Spindle & feed drives?

7 Describe the different sensors used in Robot. 10

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Th-5 Refrigeration And 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 the COP of a refrigerator.
   b. Explain closed air refrigeration cycle.
   c. What is the difference open & closed air refrigeration cycle?
   d. Define vapour absorption refrigeration system.
   e. What is the use of analyser?
   f. Write the function of expansion valve with two examples.
   g. What is humidity ratio?
   h. Write the conditions of comfort air conditioning.
   i. What is the chemical formula of refrigerant dichloro-difluro methene?
   j. Draw the schematic diagram of bell-coleman cycle.

2. Answer **Any Six** Questions 6 x 5
   a. Describe actual vapour compression with P-h & T-s diagram.
   b. Compare between VCRS & VARS system.
   c. A bell coleman refrigerator operates between pressure limits 1 bar and 8 bar. Air is drawn from the cold chamber at 9^o, compressed and then it is cooled to 29^0 before entering the expansion cylinder. Expansion and compression follows $PV^{1.35}$= constant. Calculate COP (theoretical). Take γ=1.4, C_p =1.003 kj/kgk
   d. Describe winter air conditioning.
   e. Explain the working of single acting reciprocating air compressor with neat sketch.
   f. State the factors considered for selection of an ideal refrigerant.
   g. Differentiate between summer air conditioning and winter air conditioning.

Answer Any **Three** Questions

3 The temperature limits of ammonia refrigerant system are 25^oc and -10^oc. If the gas is dry at the end of compression, calculate COP of the cycle assuming no undercooling of the liquid ammonia. 10

temp	Liquid heat(H_f)	Latent heat	Entropy of liquid
25	298.9	1166.94	1.1242
-10	135.37	1297.68	.5443

4	A refrigerating system operates on the reserved carnot cycle. The higher temperature of refrigerant in the system is 35^0C and the lower temperature is -15^0C. The capacity is to be 12 tonnes. Determine C.O.P, heat rejected from the system per hour and power required.	10
5	Explain simple vapour absorption refrigeration system with neat sketch.	10
6	Write short notes on i) Automatic expansion valve ii) Cold storage plant	10
7	What is psychometric chart? Explain different types of Psychometric process.	10