Paper / Subject Code: 89425 / Press Tool Design (DLOC)

Max. Marks: 80

29-05-24

Time: 3 Hour

N. B. 1) Question no. 1 is compulsory.
(2) Attempt any **three** questions out of remaining five questions.
(3) Illustrate your answer with necessary sketch wherever necessary.

Q1. Attempt any four of the following   20
(a) Sketch a 'push-through' and an 'inverted' draw die and label all parts.
(b) Explain with the help of neat sketch design aspects of Press tool elements.
(c) Explain different methods of mounting punches.
(d) How is the size of a blank calculated for drawing a cup?
(e) Five holes of diameter 10 mm each is to be punched in a sheet 3 mm thick at a pitch of 25 mm. What should be the minimum capacity of the press (in tons) if the yield point of the material is 50 MPa and one hole is punched per stroke?

Q2. (a) Determine the diameter of the hole that can be punched in a steel sheet of thickness 1.6   10
mm, for which the ultimate shear stress is 310 N/mm^2, if Press Capacity is 250 KN.
(b) What will be the punch size if punching is the needed operation?
(c) If the blank is to be drawn into a cup, determine the diameter of the cup after the first
draw.
(b) Explain the basic construction & working of combination dies.   10

Q3. (a) A washer with 12.7 mm internal diameter and outside diameter of 25.4 mm needs to be   10
made from 1.5 mm thick strip of 0.2 percent carbon steel. The ultimate strength of material
is 280 N/mm^2. a) Find the total cutting force if both punches act at the same time and no
shear is applied to either punch or the die. b) What will be the cutting force if the punches
are staggered, so that only one punch acts at a time? c) Taking 60 % penetration and shear
on punch as 1 mm, what will be the cutting force if both punches act together.
(b) Explain a) Types of bending b) Classify press working operations.   10

Q4. (a) Explain the defects in drawn parts with suitable sketches.   10
(b) Determine the capacity of the double bending die for the following data.   10
sheet metal thickness = 1 mm
sheet metal width at bend = 50 mm
die radius = 3 mm
punch radius = 1.5 mm
die clearance = 1.25 mm
tensile strength = 315 MPa
setting pressure = 560 MPa
beads on punch = 2
projected width of each bead = 3 mm

Q5. (a) A steel cup of height 30mm and internal diameter 40 mm with a flange width of 10 mm is   10
to be deep drawn from a sheet 1mm thick. Determine the diameter of blank and the drawing
force. What is the draw ratio? Can the cup be drawn in a single operation?
(b) Explain overloading of presses criteria while selecting the press.   10

Q6. Attempt any four of the following: 20
(a) Explain with sketch any four types of sensors used for hand protection.
(b) Explain different defects in drawn parts.
(c) Draw and label parts of shaving die and explain its working
(d) Sketch the various methods of applying shear to the punch and die.
(e) Describe Spring back effect and measures to control it.
****

54466   **Page 1 of 1**

Paper / Subject Code: 89424 / Automation and Artifical Intelligence

P.E. | Sem-VI | Mech | May.2024

27.05.2024

[Time: 3 hours]   [Total Marks: 80]

NB: 1) Question No. 1 is compulsory
     2) Attempt any three questions out of the remaining five questions.
     3) The figures to the right indicate full marks.
     4) Assume suitable data wherever required but justify the same.

Q1.   Attempt any four   (20)
    A. Justify the use of Pneumatics and Hydraulics with suitable examples.
    B. List four levels of automation with suitable examples.
    C. Explain the components of a Robotic system with a neat sketch.
    D. Explain the Architecture of PLC with a neat block diagram
    E. State the meaning of an intelligent system and explain the components of an
        intelligent system

Q2   A. Design an electro-pneumatic circuit for two-cylinder operation with the   (10)
         following sequence using 5/2 both side solenoid operated valve as DCV.
                 A+ B+ Delay A-B-
         With user selection option single cycle Multicycle operation.
     B. Differentiate between hydraulic meter-in and meter-out circuits with suitable   (10)
         applications.

Q3   A. State the types of intelligent agents. Explain the goal-based agent along with a (10)
         neat sketch.
     B. Illustrate with neat sketches the mechanical and vacuum type of end effectors   (10)
         used in robotic systems, stating their advantages and disadvantages.

Q4   A. Compare Supervised, Unsupervised, and reinforcement learning with different   (10)
         parameters.
     B. Design a hydraulic circuit for two-cylinder operation with the following sequence (10)
         using 4/2 pilot-operated valve as DCV using cascade method, A+, B+, Delay B-
         , A-

Q5   A. State the use of a decision tree. Explain the terminology of the decision tree with (08)
         a suitable example.
     B. Write note on different actuation methods for Direction control valves   (08)
     C. State the steps of the K-mean algorithm for clustering analysis   (04)

Q6   A. What is the activation function? Explain the log-sigmoid activation function   (08)
         with a neat sketch.
     B. List any five applications of Natural Language Processing (NLP).   (06)
     C. What is the activation function? Explain the log-sigmoid activation function   (06)
         with a neat sketch

55266   Page 1 of 1

Paper / Subject Code: 89424 / Automation and Artifical Intelligence

T.E. | Sem-VI | Mech | May, 2024

27-05-2024

[Time: 3 hours]   [Total Marks: 80]

NB:
1) Question No. 1 is compulsory
2) Attempt any three questions out of the remaining five questions.
3) The figures to the right indicate full marks.
4) Assume suitable data wherever required but justify the same.

Q1.   Attempt any four   (20)
A. Justify the use of Pneumatics and Hydraulics with suitable examples.
B. List four levels of automation with suitable examples.
C. Explain the components of a Robotic system with a neat sketch.
D. Explain the Architecture of PLC with a neat block diagram
E. State the meaning of an intelligent system and explain the components of an intelligent system

Q2 A. Design an electro-pneumatic circuit for two-cylinder operation with the (10)
following sequence using 5/2 both side solenoid operated valve as DCV.
       A+ B+ Delay A-B-.
With user selection option single cycle Multicycle operation.

B. Differentiate between hydraulic meter-in and meter-out circuits with suitable (10)
applications.

Q3 A. State the types of intelligent agents. Explain the goal-based agent along with a (10)
neat sketch.

B. Illustrate with neat sketches the mechanical and vacuum type of end effectors (10)
used in robotic systems, stating their advantages and disadvantages.

Q4 A. Compare Supervised, Unsupervised, and reinforcement learning with different (10)
parameters.

B. Design a hydraulic circuit for two-cylinder operation with the following sequence (10)
using 4/2 pilot-operated valve as DCV using cascade method, A+, B+, Delay B-
, A-

Q5 A. State the use of a decision tree. Explain the terminology of the decision tree with (08)
a suitable example.

B. Write note on different actuation methods for Direction control valves (08)

C. State the steps of the K-mean algorithm for clustering analysis (04)

Q6 A. What is the activation function? Explain the log-sigmoid activation function (08)
with a neat sketch.

B. List any five applications of Natural Language Processing (NLP). (06)

C. What is the activation function? Explain the log-sigmoid activation function (06)
with a neat sketch

55266   Page 1 of 1

Time: 3 hour   Max. Marks: 80

Instructions:

- 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.
- Use of steam table is permitted.

		Marks
Q.1	Solve ANY FOUR questions from following: (Each question carries 5 marks).	(20)

- a Differentiate Fire tube boiler and Water tube boiler.
- b Explain construction and working of open cycle gas turbine power plant.
- c Explain the construction and working double acting reciprocating pump with neat sketch.
- d Illustrate significance of multistage compression in reciprocating air compressor with the help of P-V Diagram.
- e Define i) Suction head ii) Delivery head iii) Static head iv) Manometric head related to centrifugal pump with neat sketch.

Q.2

a In a Parson reaction turbine, the angles of receiving tips are 35° and of discharging tips 20°. The blade speed is 100 m/s. Calculate the tangential force, power developed, diagram efficiency, and axial thrust of the turbine, if its steam consumption is 1 kg/min.   (10)

b Explain the construction and working of Economizer.   (05)

c Derive the forms of Euler's equation applicable to all turbo machines.   (05)

Q.3

a The following data refers to a gas turbine plant: (10)
   Power developed = 5 MW
   Inlet pressure and temperature of air to compressor = 1 bar and 30°C
   Pressure ratio of the cycle = 5
   Isentropic efficiency of the compressor = 80%
   Isentropic efficiency of turbines = 85%
   Maximum temperature in the turbines = 550°C
   Take for air, $C_p = 1.0$ kJ/kgK, $\gamma = 1.4$ and
   for gases, $C_p = 1.15$ kJ/kgK, $\gamma = 1.33$.
   If a reheater is used between two turbines at a pressure of 2.24 bar, calculate the following:
   (a) Mass flow rate of air,
   (b) The overall efficiency,
   Neglect the mass of fuel.

b Explain construction and working of Pelton wheel turbine.   (05)

c Explain construction and working of Turboprop engine with neat sketch.   (05)

Q.4

a A steam generator evaporates 18000 kg/hrs. of steam at 12.5 bar and a quality of (10) 0.97 dry from feed water at 105°C, when coal is fired at 2040 kg/hrs. If the higher calorific value of coal is 27400 kJ/kg, find the followings:
(a) Heat rate of the boiler in kJ/hrs.
(b) Equivalent evaporation and
(c) Thermal efficiency.

b Differentiate between boiler mounting and boiler accessories. (05)

c What is cavitation in hydraulic pump? Explain its effects on performance. (05)

Q.5

a A centrifugal pump has an impeller 0.5 m outer diameter and when running at 600 (10) r.p.m. discharges water at the rate of 8000 liters/minute against a head of 8.5 m. The water enters the impeller without whirl and shock. The inner diameter is 0.25 m, and the vanes are set back at outlet at an angle of 45° and the area of flow which is constant from inlet to outlet of the impeller is 0.06 m². Determine (a) the manometric efficiency of the pump, and (b) the vane angle at inlet.

b What is surging and chocking phenomenon in Centrifugal compressor (05)

c Explain the construction and working of Once through boiler with neat sketch. (05)

Q.6

a A single-acting, single-cylinder reciprocating air compressor is compressing 20 (10) kg/min of air from 1.1 bar and 30°C to 6 bar and delivers it to a receiver. The law of compression is $PV^{1.25}$= Constant. Find the actual power input to compressor if mechanical efficiency is 85%. Neglecting losses due to clearance, leakages and cooling.

b Explain velocity compounding in impulse turbine with neat sketch. (05)

c What is priming? Why is it necessary? (05)
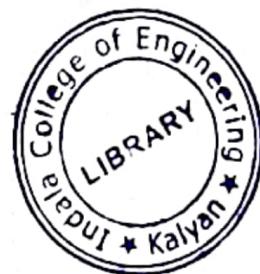
****

Time:03 Hours   Total marks – 80

N.B.   1. Question No 1 is **compulsory**

2. Solve **Any Three** questions from the remaining **Five** questions.

3. Assume any **suitable data** if necessary with justification.

4. Use of **Design Data Book** is permitted.

5. Figures to the right indicate maximum marks.

			Marks
Q1.		Attempt any **Four** of the following.	
	(a)	With neat sketch explain various types of threads used as power screws?	05
	(b)	Define stress concentration and with neat sketches show various methods to reduce the effect of stress concentration.	05
	(c)	Write in brief on Aesthetic and Ergonomics considerations in design.	05
	(d)	Explain the nipping of the leaf spring with neat sketch.	05
	(e)	State the characteristics of chain drive and discuss the polygon effect.	05
Q2.	(a)	Selecting suitable material, design a Socket and Spigot Cotter Joint for an axial load of 50 KN. Draw a neat sketch of the joint.	15
	(b)	Explain with neat sketches, various types of cyclic stresses.	05

Q3.   (a)   A radial load on 360^0 hydro dynamically lubricated self-contained bearing supports 10kN. The journal rotates at 1450 rpm. Assuming journal length to it diameter as 1 with the bearing length as 50 mm. Take radial clearance as 20 microns, eccentricity as 20 microns, specific gravity of lubricants as 0.86, specific heat of lubricants 2.09 kJ/kg ^{0}C.   **10**

Find,   i. Oil film thickness.

ii. Coefficient of friction.

iii. Viscosity

(b)   A DGBB is subjected to a radial load of 4.5 KN and axial load of 2.5 KN when operating on 600 rpm. Consider the expected life of 18000 hours with survival probability of 93%. Select suitable standard bearing.   **10**

Q4.   (a)   Design an unprotected type flange coupling to connect the output shaft of an electrical motor to the shaft of centrifugal pump. The motor delivers a power of 20 KW at 900 rpm. Select suitable material for various parts.   **10**

ICoE/ Lib/ TE/ Sem VI/ Mech/ C-scheme/ MD/ 15/05/2024

X1118Y399302X1118Y399302X1118Y399302X1118Y399302

(b) Fig. No.1 shows a welded joint subjected to an eccentric load of 20KN. Determine the uniform size of weld on entire length of two legs. Take permissible shear stress as 100 MPa. 10

20KN

150mm

G

100 mm
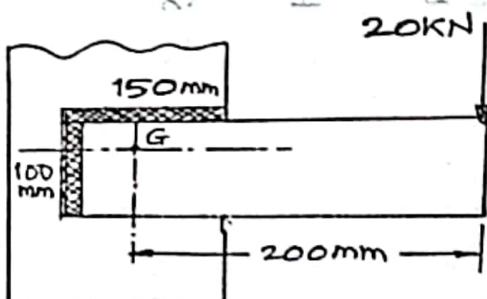
200mm

(Fig. No.1)

Q5. (a) A spur gear of 250 mm PCD is mounted at 300 mm to the right of left hand bearing and a 450 mm diameter pulley is mounted at 200 mm to the left of right hand bearing. The shaft is supported in bearing 900m apart and transmits 20 KW at 400 r.p.m. A gear is driven by a pinion located vertically above and the pulley transmits power through belt to another pulley located vertically below it. The belt tension ratio at pulley is 2. The pulley weighs 500 N. Select suitable material and design shaft. 10

(b) A multi-plate clutch transmits a power of 75 kW at 3000 rpm. The plates run in oil and coefficient of friction is 0.07. Axial intensity of pressure is not to exceed 0.15 N/mm². Due to space limitation external radius is restricted to 125 mm. Assuming number of springs as 6, design a) Input and Output Shaft b) Friction and pressure plates. 10

Q6. (a) A flat belt drive is used to transmit 6 kW power from an electric motor rotating at 1440 rpm to the blower operating at 400 rpm for 10 hours/ day and the expected life of belt is two and half years approximately. Centre to centre distance is 950 mm. Find 10

a. Driving and Driven pulley diameter.

b. Considering Rubber Canvas Material for the belt, determine the thickness and width of the belt.

(b) A single cylinder four stroke cycle internal combustion engine produces 15 KW power at 700 rpm. Design a suitable flywheel, assuming coefficient of fluctuation of speed as 0.04. The torque developed during the power stroke may be considered as sine curve and work done during the power stroke is 30% more than the work done per cycle. 10

****