B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E.
Branch: Industrial Engineering and Management
Course Code: 22IM4PCFPT
Course: Fundamentals of Programming Tools

Semester: IV
Duration: 3 hrs.
Max Marks: 100

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

				CO	PO	Marks
			UNIT - I			
1	a)		What are the basic sensors used in the field of Industrial Engineering?	CO1 CO2	PO1	**10**
	b)		What are the differences between an Enterprise Engineer and an Enterprise Architect?	CO1 CO2	PO1	**10**
			OR			
2	a)		How is a Programming Tool important to an Industrial Engineer?	CO1 CO2	PO1	**10**
	b)		Give a brief description of various types of sensors used in Ergonomics.	CO1 CO2	PO1	**10**
			UNIT - II			
3	a)		What are the main features of an Arduino board? What are the Industrial Applications of Arduino boards?	CO2	PO2	**12**
	b)		How is the brightness of an LED light controlled using an Arduino Board?	CO2 CO3	PO2	**08**
			UNIT - III			
4	a)		What are the different types of Raspberry pi boards? Draw the circuit diagram of a typical Raspberry pi board and label all its parts.	CO1 CO2	PO1	**12**
	b)		How are Raspberry pi boards used in industries?	CO1 CO2	PO1	**08**
			UNIT - IV			
5	a)		Write a Python program demonstrating the use of the FOR loop.	CO3 CO4	PO3	**06**

				CO	PO	Marks
		b)	Explain the various features of Tuples and Lists in Python.	CO2 CO3	PO2	**06**
		c)	What are the features and advantages of the Python programming language?	CO2 CO3	PO2	**08**
			UNIT - V			
	6	a)	Solve the equation f(x) = x^2-25 =0 correct to 2 decimal places using False position method, by hand calculation and Python code	CO4	PO3	**12**
		b)	Write the respective algorithm and flowchart for the above question.	CO4	PO3	**08**
			OR			
	7	a)	Write a Python program for finding if the given number is odd/even	CO4	PO3	**04**
		b)	i) Solve the equation f(x) = tan(x) – 2x using the Simpson's 3/8 rule, by hand calculation and Python code	CO4	PO3	**08**
		c)	ii) Write the respective algorithm and flowchart for the above question on Simpson's 3/8 rule.	CO4	PO3	**08**

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April 2024 Semester End Main Examinations

Programme: B.E.
Branch: Industrial Engineering and Management
Course Code: 22IM4PCINE
Course: Industrial Engineering

Semester: IV
Duration: 3 hrs.
Max Marks: 100

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of tables permitted.

<div style="writing-mode: vertical">**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.</div>

			UNIT - I	*CO*	*PO*	**Marks**
1	a)		What were the contribution of different pioneers who brought the development of Industrial Engineering?	*CO1*		**07**
	b)		Explain the productivity at national and international level. What are the factors that are contributing the productivity improvement?	*CO1* *CO2*		**06**
	c)		The data for output produced and inputs consumed for a particular type of a manufacturing organization are given below in constant money value. Find out the partial, total-factor and total productivity values. Output = Rs. 2000.00 Labour input = Rs. 400.00 Material input = Rs. 200.00 Capital input = Rs. 500.00 Energy input = Rs. 100.00 Other expenses input = Ks. 50.00	*CO2* *CO3*	*PO2* *PO3*	**07**
			UNIT - II			
2	a)		Explain with an example the steps involved in conducting a "Method Study".	*CO1* *CO2*	*PO1*	**10**
	b)		Prepare an Two hand Process Chart for an assembly of screw jack consisting of a body, cap, spindle, bolt and nut washers and tommy bar assuming suitable work place layout using principles of motion economy.	*CO3*	*PO3*	**10**
			OR			

	3	a)	Explain the term motion economy.	CO1		**04**
		b)	With an example and neat sketch explain how the principles of motion economy related to arrangement of workplace.	CO2	PO2	**08**
		c)	Explain the steps for constructing the SIMO-Chart	CO2	PO2	**08**
			UNIT - III			
	4	a)	Explain the three types of stop watches in general used for time study.	CO3	PO3	**06**
		b)	Explain how the jobs are broken down into various elements for conducting time study. Explain any 5 elements with an example.	CO2	PO1	**07**
		c)	What is work sampling? With an aid of tossing 5 coins 100 times and tossing large number of coins more than 100 times and observing them how do you arrive at describing the probability of occurrence.	CO3	PO2	**07**
			OR			
	5	a)	What is Skill and effort rating? Explain how the performance rating factor is determined with the synthetic rating.	CO2	PO1	**07**
	5	b)	A job has been sub-divided into 4 elements. The time for each element and respective rating are given below	CO3	PO3	**07**
		c)	Explain the MTM motion element R1C and G1C3 and if the elements takes 10.8 TMU then calculate the normal time.	CO3	PO3	**06**
			UNIT - IV			
	6	a)	With a neat sketch explain the System approach to ergonomic models.	CO4	PO2	**05**
		b)	Explain the term WRMSD. What are warning signs of WRMSD? What are the precautions and ergonomic improvement of WRMSD?	CO4	PO2	**08**
		c)	What are the long time health effects of fatigue and what are fatigue prevention terms and how the prevention of fatigue benefits the Industrial workers in the workplace?	CO4	PO2	**07**

For question 5 b), the embedded table:

Element Number	Observed time	Rating Factor %
1	0.6	100
2	1.0	80
3	1.2	130
4	1.5	90

Calculate the normal time and standard time for each element and for the job if the allowance is 5%.

			UNIT - V			
7	a)		Discuss any 5 design recommendation for the displays. With an example explain what is qualitative displays	CO5	PO3	**06**
	b)		With a neat sketch of permissible work area explain ergonomic factors considered for designing of workplace.	CO5	PO3	**06**
	c)		Explain the terms with respect to Industrial Engineering i) Total quality management ii) Enterprise resource planning iii) Supply chain and logistics management iv) Agile manufacturing	CO5	PO3	**08**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E.
Branch: Industrial Engineering and Management
Course Code: 22IM4PCMCD
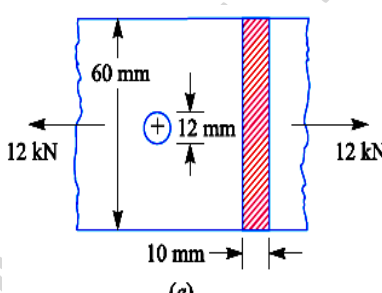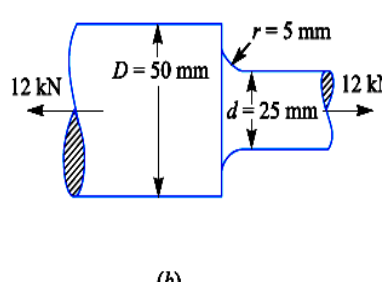**Course:** Machine Design

Semester: IV
Duration: 3 hrs.
Max Marks: 100

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	CO	PO	Marks
1	a)		Explain the following theories of failure: i) Maximum Principal stress theory ii) Maximum Shear stress theory iii) Distortion Energy theory.	CO1	PO1	**10**
	b)		Find the maximum stress induced in the following cases taking stress concentration into account: 1. A rectangular plate 60 mm ×10 mm with a hole 12 diameter as shown in Fig. (a) and subjected to a tensile load of 12 kN. 2. A stepped shaft as shown in Fig.(b) and carrying a tensile load of 12 kN. 	CO2	PO2	**10**
			-OR-			
2	a)		Derive the Soderberg relation subjected to reversed bending load.	CO2	PO2	**08**
	b)		A steel rod made up of SAE 9260 oil quenched material with ultimate tensile stress = 1089.5 N/mm², yield tensile stress = 689.4 N/mm², Endurance strength = 427.6 N/mm² is subjected to a tensile load which varies 120 kN to 40 kN. Design the safe diameter of the rod using "Soderberg Diagram". Adopt factor of safety as 2. Stress concentration factor as unity and correction factors for load, size and surface as 0.75, 0.85 and 0.91 respectively.	CO3	PO1 PO3 PO4	**12**

			UNIT - II			
3	a)		Design a socket and spigot type cotter joint to sustain an axial load of 80,000N. The material selected for the joint is C-40 steel. Take a factor of safety of 1.75	*CO3*	*PO1* *PO3* *PO4*	**10**
	b)		Design a cast iron protective type flange coupling to transmit 15 kW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used: Shear stress for shaft, bolt and key material = 40 MPa Crushing stress for bolt and key = 80 MPa Shear stress for cast iron = 8 MPa	*CO3*	*PO1* *PO3* *PO4*	**10**
			UNIT - III			
4	a)		Derive the Lewis equation for the beam strength of gear teeth.	*CO2*	*PO2*	**08**
	b)		Design a pair of spur gear. It transmits 20KW from a shaft rotating at 750 rpm to a parallel shaft which is to rotate at 280 rpm. Assume number of teeth on pinion 28 and 20^0 full depth tooth form. The material for pinion is C40 steel untreated and for gear forged steel about 0.30% C untreated. Determine module & face width. Also, suggest suitable surface hardness for the weaker member based on dynamic & wear load considerations.	*CO3* *CO4*	*PO1* *PO3* *PO4* *PO12*	**12**
			UNIT - IV			
5	a)		A shaft is supported by two bearings placed 1 m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and μ = 0.24. Determine the suitable diameter for a solid shaft, allowing working stress of 63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley.	*CO3* *CO4*	*PO1* *PO3* *PO4* *PO12*	**20**
			OR			
6	a)		Determine the diameter of a hollow shaft to transmit a power of 80 kW at a rated speed of 1000 rpm and sustain a bending moment of 25N-m, limiting the twist to 1.5° in a length of 800 mm. Material selected for the shaft has a design shear stress of 75 MPa. Ratio of the diameter should be 0.7. Modulus of Rigidity (G) = 82.7GPa.	*CO3* *CO4*	*PO1* *PO3* *PO4* *PO12*	**10**

		b)	A steel spindle transmits 5 HP at 800 rpm. The angular deflection should not exceed 1.5º per meter length of the spindle. The rigidity modulus G = 8.4 x 10^3 MPa. Find the diameter of the spindle and shear stress induced in the shaft.	CO3 CO4	PO1 PO3 PO4 PO12	**10**
			UNIT - V			
7	a)		Derive Petroff's equation using suitable notations. State the assumptions made.	CO2	PO2	**08**
	b)		SAE 20 oil is used to lubricate a hydrodynamic journal bearing of diameter 75mm and length 75mm, oil enters at 40^0C. The journal rotates at 1200rpm. The diametral clearance is 75µm. Assume operating temperature of the oil as 53^0C and determine: Magnitude and location of the minimum oil film thickness, Power loss, Oil flow through the bearing and Side leakage	CO3 CO4	PO1 PO3 PO4 PO12	**12**

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April 2024 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Industrial Engineering and Management **Duration: 3 hrs.**
Course Code: 22IM4PCCIM **Max Marks: 100**
Course: Computers in Manufacturing
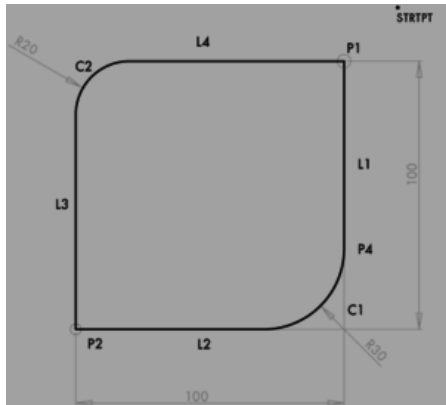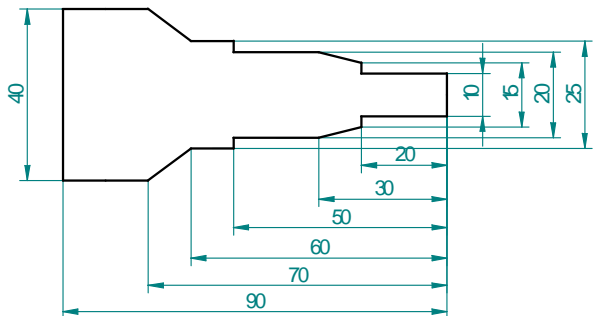
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Compare a CIM environment with a conventional manufacturing environment to list and explain the areas of computerization.	CO1	PO1	**10**
	b)		What are the steps in a Product Life Cycle in both conventional and computerized production set ups? Explain them.	CO1	PO1	**10**
			OR			
2	a)		What are the functions of a Graphics Package? Explain their types that are widely used in CAD?	CO1	PO1	**08**
	b)		The vertices of a quadrilateral are (1,1), (2,4), (8,4) and (10,1). Find the new coordinates of the vertices if the quadrilateral are first rotated 10° counter clockwise direction about the origin and then subsequently scaled to twice its size. Show the transformation calculations and draw the quadrilaterals on graph paper.	CO1 PO2	PO1 PO2	**06**
	c)		Explain the utility of a Wire Frame Model as well as a Solid Model.	CO1	PO1	**06**
			UNIT - II			
3	a)		What is a NC system? Mention and explain different tape formats adopted in a NC machine tool.	CO1	PO1	**08**
	b)		How different types of drive systems in CNC System and their benefits? Explain each one of them.	CO1	PO1	**06**
	c)		Mention different types of motion Control Systems in NC machine tools.	CO1	PO1	**06**

			UNIT - III			
4	a)		With a neat sketch indicate the tool signature on a single point cutting tool.	CO1	PO1	**08**
	b)		What is ATC? List and explain the steps in working of an ATC?	CO1	PO1	**06**
	c)		What is an Adaptive Control System? Explain its functions with its types.	CO1	PO1	**06**
			UNIT - IV			
5	a)		Explain the structure of CNC Manual Part Program.	CO1 CO2	PO1 PO2	**06**
	b)		Write an APT Program to machine the part shown below.	CO1 CO2	PO2 PO3 PO12	**14**
			OR			
6	a)		Explain the program statements used in APT Programming with suitable examples.	CO1 CO2	PO1 PO2	**08**
	b)		Write a complete Manual Part Program for the part shown below. Assume any missing data suitably.	CO1 CO2	PO2 PO3 PO12	**12**
			UNIT - V			
7	a)		Explain with neat sketches different types of Robot configurations.	CO1	CO1 PO2 PO3	**08**
	b)		What are robot work cell control and interlocks? Explain.	CO1	CO1 PO2 PO3	**06**
	c)		Explain the different methods of Robot Programming.	CO1	CO1 PO2 PO3	**06**

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