

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 4th Year 2nd Term Examination, 2022

ME 4207

(Tool Engineering & Machine Tools)

Time: 3 Hours

Total Marks: 210

- N.B.:** i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

SECTION-A

- | | | |
|------|---|----|
| 1(a) | Define "Locating" and "Clamping" of a workpiece. Describe different types of clamps with neat sketches. | 15 |
| 1(b) | State and explain the 3-2-1 principle of work piece location. | 10 |
| 1(c) | Write down the purposes and functions of a work holder. Describe the degrees of freedom of a workpiece located in a space. | 10 |
| 2(a) | Write down the design parameters of drill bushings. Describe the chip control in drilling process. | 12 |
| 2(b) | How are jigs deferred from fixture? Describe leaf jig and indexing jig with sketches. | 13 |
| 2(c) | State the essential feature of a milling fixture. How do the cutters set in relation to the work in a milling fixture? | 10 |
| 3(a) | When should magnetic chucks be used in a lathe machine and when should they be avoided? Explain the working principle of a four jaw independent chuck. | 12 |
| 3(b) | What are the purposes of mandrel? How do plain and expanding mandrels differ? | 06 |
| 3(c) | Explain the mathematical procedure to determine the center of pressure for blanking. | 12 |
| 3(d) | Explain the functions of vise fixtures. | 05 |
| 4(a) | Explain the term bend allowance with the help of a necessary diagram. Also describe the method of determining blank length of a bent product. | 10 |
| 4(b) | What is spring back? Discuss the methods of preventing spring back. | 10 |
| 4(c) | A cup is to be drawn with a shell height of 5 inch and a shell diameter of 5 inch. The corner diameter is 1/8 inch. The thickness of the workpiece material is 0.08 inch. The workpiece material is 1020 cold rolled steel. Assuming the yield strength of the material is 60000 psi. Determine the size of the blank, percentage reduction and drawing pressure. | 15 |

SECTION-B

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|------|--|----|
| 5(a) | Differentiate between machine and machine tool. Also write down the purposes and characteristics of machine tools. | 10 |
| 5(b) | How does the power transmission mechanism in a milling machine differ from lathe machine? Explain. | 10 |
| 5(c) | How have modern machine tools evolved to improve efficiency and precision in manufacturing? | 10 |
| 5(d) | Differentiate among laser cutting, oxy-fuel cutting and plasma cutting. | 05 |

6(a)	What are the primary components of a machine tool drive and why is it crucial for the drive to regulate the speed of operating elements?	10
6(b)	Describe and differentiate a ray diagram and a saw diagram with necessary sketches.	10
6(c)	Describe different types of elementary transmission that transform rotary motion into translatory motion.	15
7(a)	Write short notes on: (i) Ratchet-Gear mechanism and (ii) Geneva mechanism.	10
7(b)	With the help of neat sketches, explain the working principle of a Meander gearbox.	13
7(c)	What are the methods of obtaining different spindle speed?	03
7(d)	What are the factors that need to be considered while designing a machine tool structure? Discuss numerical control system for simple turning operations.	09
8(a)	What are the causes of machine tool vibration and how does it affect the performance? Mention the ways of elimination of machine tool vibration.	10
8(b)	Explain the concept of overall machining time and its components. How does production cost relate with the cutting velocity? Explain with necessary graphs.	10
8(c)	What is machine tool maintenance? Also show the power transmission system of a Lathe machine.	08
8(d)	Differentiate between HSM and conventional machining.	07

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

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B. Sc. Engineering 4th Year 2nd Term Examination, 2022

ME 4019

(Aerodynamics)

Time: 3 Hours

Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.

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SECTION-A

- 1(a) What are the sources of aerodynamic forces? Mention the basic control surfaces of an airplane and their functions. 12
- 1(b) Describe standard airfoil nomenclature. Explain the geometry of NACA 2414 and NACA 23012 airfoils. 10
- 1(c) What is circulation? How can lift be calculated using the value of circulation around an airfoil? 13
- 2(a) 'Nature enforces the Kutta condition by means of friction.' - Explain the statement. 10
- 2(b) Describe Kutta-Joukowski theorem. 06
- 2(c) Why is an airfoil surface replaced with vortex sheet in thin airfoil theory modelling? Explain. 06
- 2(d) Consider a NACA 2414 airfoil with a chord of 0.70 m in an air stream at standard sea level conditions. The free stream velocity is 70 m/s. The lift per unit span is 1250 N/m. Calculate the coefficient of drag and the strength of steady-state starting vortex. 13
- 3(a) Derive the fundamental equation of classical thin-airfoil theory. 18
- 3(b) Show that the lift coefficient is linearly proportional to the angle of attack and the lift slope is 2π . 17
- 4(a) What is an aerodynamic center? What would be the expression of moment coefficient for a symmetric airfoil in the aerodynamic center? 10
- 4(b) What is downwash? Explain the effect of downwash on the local flow over a local airfoil section. 15
- 4(c) Explain the Biot-Savart law and Helmholtz's theorem with a neat sketch. 10

SECTION-B

- 5(a) For a finite wing, the elliptical lift distribution follows, 12
$$\Gamma(y) = \Gamma_0 \sqrt{1 - (2y/b)^2}$$
, where Γ_0 is the circulation at origin, b is the wing span and $\Gamma(y)$ is the circulation along span. Show that the downwash is constant over the span for an elliptical lift distribution.
- 5(b) What are the aerodynamic characteristics of a finite wing which are different from the properties of its airfoil section? 10
- 5(c) What is meant by compressibility correction and when this must be accounted for subsonic flow? Differentiate compressible flow from incompressible flow with neat sketches. 13
- 6(a) Show that the linearized pressure coefficient only depends on the x component of the perturbation velocity. 10

- 6(b) How do the (i) swept wing concept and (ii) super-critical airfoil reduce the wave drag in transonic flight? Explain using appropriate sketches. 10
- 6(c) Derive an expression of velocity potential equation from the continuity equation for steady, 2D compressible flow. 15
- 7(a) For small perturbation, prove that the pressure coefficient $C_p = \frac{-2\hat{u}}{V_\infty}$, where \hat{u} is the perturbation velocity and V_∞ is the free stream velocity. 15
- 7(b) Describe the following terms with neat sketches: 09
 (i) Drag-divergence Mach number, (ii) Critical Mach number, and (iii) Area rule.
- 7(c) Assume the pressure coefficient at a given point on the surface of an airfoil is -0.35 at a very low speed. If the free stream Mach number is 0.68, calculate C_p at this point. 11
- 8(a) Describe various characteristics of hypersonic aerodynamics and how its aerodynamics characteristics differ from supersonic and subsonic. 10
- 8(b) Derive the Newton's sine-square law for hypersonic flow. 15
- 8(c) Explain the relationship between the angle of attack and the drag coefficient in supersonic and hypersonic flow over a wing. 10

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 4th Year 2nd Term Examination, 2022

ME 4229

(Industrial Management and Professional Ethics)

Time: 3 Hours

Total Marks: 210

- N.B.:** i) Answer any THREE questions from each section in separate scripts.
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SECTION-A

- 1(a) Define management. Enumerate the basic principles of scientific management. 10
- 1(b) Briefly explain the 14 point principle of Henry Fayol's theory of management. 12
- 1(c) Discuss the Equity theory of motivation. Also state the different inequity reactions. 13
- 2 Rahat with some of his friends recently started a business of selling customized clothes. They are new to the world of business and confused about organizational structures and managerial functions. However, Rahat has high vision and knows how to manage people.
- (a) Suggest a suitable organizational structure for the business. Justify your decision based on advantages and disadvantages. 15
- (b) What type of leader is Rahat? Explain and justify. 10
- (c) What are the functions of management he should keep in mind? Explain with flow chart. 10
- 3 Mr. Kabir is an experienced HR manager. His team is small but efficient. He says, "The integration of different HR software and tools has made my life easier."
- (a) Justify the statement with examples. 15
- (b) How can Mr. Kabir boost employees' moral? 10
- (c) Point out and describe the steps in manpower planning. 10
- 4(a) Compare and contrast job enlargement and job enrichment. 08
- 4(b) Define job evaluation. Explain point rating method of job evaluation. 15
- 4(c) Write short notes on: 12
- (i) Job rotation
- (ii) Fringe benefits
- and (iii) Merit rating.

SECTION-B

- 5(a) Describe shortly the essential conditions for applying budgetary control. 10
- 5(b) What is meant by decision making? Illustrate the required steps for effective decision making. 13
- 5(c) Shortly describe the major marketing concepts. 12
- 6(a) Write short note on Research and Patent. 10
- 6(b) Define purchasing. Enlist purchase parameters and purchasing methods. 08
- 6(c) Discuss sales promotions techniques and distribution channels of goods briefly. 08
- 6(d) Explain the life cycle of a new product with the help of a suitable diagram. 09

- 7(a) Define ethics. Why ethics is important in engineering profession? 10
- 7(b) Explain the following terms: 15
 (i) Normative ethics, (ii) Metaethics and (iii) Applied ethics.
- 7(c) Distinguish between personal and professional ethics. 10
- 8(a) Name and list different ethical theories with their classifications. 08
- 8(b) Distinguish between Deontology and Consequentialism. 08
- 8(c) A brilliant transplant surgeon has five patients, each in need of a different organ, each of whom will die without that organ. Unfortunately, there are no organs available to perform any of these five transplant operations. 12
 A healthy young traveler, just passing through the city where the doctor works in, comes in for a routine checkup. In the course of doing the checkup, the doctor discovers that his organs are compatible with all five of his dying patients. Suppose further that if the young man were to disappear, no one would suspect the doctor.
 Is it permissible for the doctor to use the organ from the traveler to save the lives of the five patients? Explain with the help of various ethical theories.
- 8(d) Explain the following code of ethics, 07
 “Engineers shall avoid deceptive acts.”

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 4th Year 2nd Term Examination, 2022

ME 4057

(Material Handling & Maintenance Engineering)

Time: 3 Hours

Total Marks: 210

- N.B.:** i) Answer any THREE questions from each section in separate scripts.
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SECTION-A

- 1(a) Define material handling. What principles would you consider in designing a new material handling system? Explain them. 10
- 1(b) What is angle of repose? How does moisture content and flowability effect on angle of repose? 08
- 1(c) "Belt conveyor is widely used in industries for material transportation"-Do you agree? Explain your answer. 07
- 1(d) Show that the capacity of conveying machines grows with an increase in the cross-section of the tube, the loading efficiency and the rate of conveyance. 10
- 2(a) Show the general construction of a belt conveyor and label its important components. 10
- 2(b) Why is ply used in rubberised belt conveyor? How can belt ends be fastened? Describe vulcanization system of belt ends fastening. 10
- 2(c) What is the function of idler roller in belt conveyor? Explain. 07
- 2(d) What is an apron conveyor? What are the merits and demerits of apron conveyor over belt conveyor? 08
- 3(a) Describe the applications, advantages and disadvantages of flight conveyor. 06
- 3(b) Explain the working principle of a screw conveyor with neat sketch. 10
- 3(c) Draw the different types of screw used in screw conveyor. 06
- 3(d) A horizontal screw is to be designed to convey molding sand of a bulk weight $\gamma = 1.65$ ton/m³, required capacity $Q = 35$ ton/hour, the conveying run length $L = 20$ m. Calculate the main parameters: μ , D , N , M_g , S , q , P of the conveyor, with symbols have their usual meaning. 13
- 4(a) What roles do hopper and feeder play in material handling system? Explain oscillating and disk type feeders. 10
- 4(b) How do ladder chutes facilitate the safe and efficient movement of materials from elevated to lower levels? Describe in details. 08
- 4(c) What is vibrating conveyor? Classify and explain different types of vibrating conveyor. 08
- 4(d) Describe the operating principle of hydraulic elevator. 09

SECTION-B

- 5(a) Mention the factors that are essential in developing a sound maintenance department organization. 07
- 5(b) What is meant by periodic maintenance? Establish a periodic maintenance schedule for a SI engine. 15
- 5(c) Explain preventive maintenance and corrective maintenance. Discuss about the preventive maintenance for a gas turbine. 13

6(a)	What are single grade and multi-grade oil? Write down the use of single grade and multi-grade oil with example.	08
6(b)	Mention the causes, corrections and preventions of belt wear and belt slipping.	08
6(c)	Explain the maintenance procedure of a centrifugal pump.	10
6(d)	Describe different types of gear tooth wear and failure.	09
7(a)	Why are additives used in lubricating oil? Write down the difference between grease and oil.	08
7(b)	What are the factors affecting viscosity of lubricating oil of an engine?	08
7(c)	What are the main wears out problem in steam turbines? How can they be detected and inspected?	09
7(d)	Why are seals used? What are the different types of seals used in the field of maintenance?	10
8(a)	How would you maintain an industrial boiler? Mention the safety measures to be taken before starting a boiler.	12
8(b)	What are the symptoms of the requirement of engine reconditioning? Write down the reconditioning procedure of cylinder block and a fuel pump.	11
8(c)	Diagnose the following defects of an engine:	12
	(i) Poor ignition	
	(ii) Engine overheat	
	(iii) Excessive oil consumption	