

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 1st Year Backlog Examination, 2018

ME 1107

(Manufacturing Process)

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) | Why the understanding of manufacturing process is essential for better production? Describe five major categories of production process with examples. | 11 |
| 1(b) | Define permeability. What are the factors affecting permeability of a mould? Explain how permeability is tested using permeability meter. | 10 |
| 1(c) | Define pattern. Describe split pattern, gated pattern, sweep pattern, and segmental pattern with necessary sketch. | 14 |
| 2(a) | Why core and core print are used in casting process? List the characteristics of core. | 08 |
| 2(b) | Briefly explain the causes and remedies of casting defects. | 11 |
| 2(c) | Describe the working procedure of precision investment casting with necessary diagram. | 16 |
| 3(a) | Distinguish between soldering, brazing and braze welding. Explain thermit welding process with necessary sketches. | 15 |
| 3(b) | What is weldability? Explain various welding terminology and zones in a weld joint with figure. | 10 |
| 3(c) | Compare TIG and MIG welding processes. Also describe the properties of neutral, reducing and oxidizing flame used in oxyacetylene gas welding. | 10 |
| 4(a) | What is welding defects? Write down the types of welding defects that occurs during welding and how it can be inspected? | 10 |
| 4(b) | What is metal forming? What are the purposes of metal forming? Mention how hot working differs from cold working? | 10 |
| 4(c) | Briefly describe different types of forging process with appropriate sketches. | 06 |
| 4(d) | Write short note on:
(i) Extrusion (ii) Blanking and (iii) Punching. | 09 |

SECTION-B

- 5(a) What is metal cutting? Distinguish between orthogonal cutting and oblique cutting. 08
- 5(b) Draw a single point cutting tool and show its different angles and elements. 10
- 5(c) What is meant by tool signature (10, 20, 9, 6, 8, 16, 1/16)? 07
- 5(d) A 30 mm H.S.S drill is used to drill a hole in a cast iron block which is 100 mm thick. Determine the time required to drill the hole if feed is 0.3 mm/rev. Assume an over travel of drill as 4 mm. The cutting speed is 20 mm/min. 10
- 6(a) Name and describe the major parts of a lathe machine, mentioning their functions with neat sketches. 10
- 6(b) Classify cutting fluid. What are the functions of cutting fluid? 10
- 6(c) Differentiate between a planer and a shaper machine. 08
- 6(d) Describe how quick return mechanism works in shaper machines? 07
- 7(a) Define indexing. What are the common available methods of indexing? Explain simple and angular indexing method. 12
- 7(b) Explain up-milling and down-milling with appropriate figures and applications. 12
- 7(c) What are the most important parameters to select a grinding wheel? Describe the meaning of the grinding wheel whose specification is '62-C-70-L-7-V-23'. 11
- 8(a) Explain the following terms: 09
(i) Honing (ii) Lapping and (iii) Super finishing.
- 8(b) Why non-conventional methods of machining are very much essential? Explain. 07
- 8(c) Distinguish between ECM and EDM. Write down the advantages and disadvantages of ECM. 10
- 8(d) Explain the process of ultrasonic machining (USM) with its schematic diagram. 09

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering
B. Sc. Engineering 1st Year Backlog Examination, 2018
Math 1105
(Mathematics I)

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) Discuss the continuity and differentiability of $f(x)$ at $x = 1$, where 12
- $$\begin{aligned} f(x) &= 1 - 2x && \text{for } x < 0 \\ &= 1 && \text{for } 0 \leq x < 1 \\ &= 2x - 1 && \text{for } x \geq 1 \end{aligned}$$
- 1(b) Define explicit function and implicit function with example. 11
Differentiate $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $\tan^{-1} x$.
- 1(c) State Leibnitz's theorem. If $y = a \cos(\log x) + b \sin(\log x)$, then find y_{n+2} by using Leibnitz's theorem. 12
- 2(a) State Mean Value theorem. Expand $2x^3 + 7x^2 - x - 1$ in power of $(x - 2)$. 11
- 2(b) If $u = z \tan^{-1}\left(\frac{y}{x}\right)$, then find the value of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$. 12
- 2(c) If u be a homogeneous function of x and y of degree n having continuous partial derivatives, then prove that 12
- $$\left(x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}\right)^2 = n(n-1)u.$$
- Where, $\left(x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}\right)^2 = x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$.
- 3(a) Write the intermediate forms. Evaluate: 12
- $$\lim_{x \rightarrow 1} \left(\frac{x}{x-1} - \frac{1}{\log x} \right).$$
- 3(b) Find the equation of tangent to the curve $xy^2 = 4(4-x)$ at the point where it is cut by the line $y = x$. 11
- 3(c) If $x \cos \alpha + y \sin \alpha = P$, touch the curve $\frac{x^m}{a^m} + \frac{y^m}{b^m} = 1$, then show that 12
- $$(a \cos \alpha)^{\frac{m}{m-1}} + (a \sin \alpha)^{\frac{m}{m-1}} = P^{\frac{m}{m-1}}.$$
- 4(a) Discuss the maxima and minima of $12(\log x + 1) + x^2 - 10x + 3$. 12
- 4(b) Determine the asymptotes of $y^3 - x^2y + x^2 + y^2 - 4 = 0$. 11
- 4(c) Find the radius of curvature and centre of curvature at the point (3,1) on the curve $y = x^2 - 6x + 10$. 12

SECTION-B

5 Answer any three of the followings: 35

(i) $\int \tan^{-1} \sqrt{x} \, dx$

(ii) $\int \frac{1 - \sin x + \cos x}{1 + \sin x - \cos x} \, dx$

(iii) $\int \frac{dx}{x^3 + 1}$

(iv) $\int \frac{dx}{(1+x)\sqrt{1+2x-x^2}}$

6 Answer any three of the followings: 35

(i) $\int_0^\pi \frac{x \, dx}{1 + \sin x}$

(ii) $\int_0^1 \frac{\sin^{-1} x}{x} \, dx$

(iii) $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\tan x}}{\sqrt{\tan x} + \sqrt{\cot x}} \, dx$

(iv) $\int_0^\pi x \log \sin x \, dx.$

7(a) Obtain a reduction formula for $\int x^m(1-x)^n \, dx$. Find the value of 13
 $\int_0^1 x^3(1-x)^4 \, dx.$

7(b) Evaluate: 12
$$\lim_{n \rightarrow \infty} \left[\frac{n+2}{n^2+1} + \frac{n+4}{n^2+4} + \frac{n+6}{n^2+9} + \dots + \frac{n+2n}{n^2+n^2} \right].$$

7(c) Evaluate: 10
$$\int_1^2 \frac{dx}{(x+1)\sqrt{x^2-1}}.$$

8(a) Prove that: $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}.$ 10

8(b) Find the area of the region bounded by the curve $a^2y^2 = x^3(2a-x)$, $a > 0.$ 12

8(c) Find the whole parameter of the curve $x^{2/3} + y^{2/3} = a^{2/3}.$ 13

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering
B. Sc. Engineering 1st Year Backlog Examination, 2018

Ph 1105 (Old)
(Physics I)

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) Establish the differential equation of simple harmonic motion and solve it to obtain an expression for displacement. 12
- 1(b) Two simple harmonic vibrations acting at right angles to each other have the time period in the ratio 1:2. The phase difference between the two vibrations is $\pi/2$. Show graphically that the resultant curve is a parabola. 13
- 1(c) The force and displacement of a simple dynamic system undergoing sinusoidal excitation are given by the equations
 $F = 10 \sin\left(\frac{\pi t}{10}\right)$ Newton's and $Y = 2 \sin\left(\frac{\pi t}{10} - \frac{\pi}{4}\right)$ m.
Calculate the work done by the excitation force in (i) 20 seconds and (ii) 3 minutes. 10
- 2(a) What are damped vibrations? Obtain an expression for the displacement in the case of a damped oscillatory motion. 15
- 2(b) Show that the energy density of a plane progressive wave is given by
 $E = 2\pi^2 n^2 a^2 \rho$, where the symbols have their usual meanings. 10
- 2(c) An under damped harmonic oscillator has its amplitude reduced to $\frac{1}{10}$ th of its initial value after 100 oscillations. Its time period is 12.5 sec.
(i) Calculate the damping constant and relaxation time.
(ii) If the observed value of the first amplitude of the oscillation be 2.2 cm, what would be its value in the absence of damping? 10
- 3(a) State the laws of transverse vibration of stretched strings and describe the experiments to verify the law concerning (i) length (ii) tension and (iii) linear density. 12
- 3(b) What is beat? Discuss analytically the formation of beats and show that the number of beat produced per second is equal to the difference in frequency of the two notes. 13
- 3(c) A motor car sounding a horn at a frequency of 110 Hz moves away from a stationary observer towards a rigid flat wall with a velocity of 40 km/hr. How many beats per second will be heard by the observer? The velocity of sound in air is 332 m/sec. 10
- 4(a) Discuss acoustic intensity level and acoustic pressure level. 08
- 4(b) Derive an expression for reverberation time of a dead room. 13
- 4(c) Discuss how to measure the absorption coefficient of a material inside the room. 06
- 4(d) An observer on a railway platform observed a train passing through the station at a speed 'a', show that the frequency of the whistle changes by $nv\left(\frac{2a}{v^2-a^2}\right)$. 08

SECTION-B

- 5(a) Discuss Huygens principle and coherent sources. 08
- 5(b) What are Newton's rings and how are they formed? How can the refractive index of a liquid be determined using these fringes? 17
- 5(c) A light source emits light of two wavelengths $\lambda_1=4300\text{\AA}$ and $\lambda_2=5100\text{\AA}$. The source is used in a double slit interference experiment. The distance between the sources and the screen is 1.5 m and the distance between the slits is 0.025 mm. Calculate the separation between the third order bright fringes due to these two wavelengths. 10
- 6(a) What is meant by diffraction of light? Distinguish between Fresnel and Fraunhofer classes of diffraction. 10
- 6(b) Mention the construction and theory of plane transmission grating and show how a grating is used to find the wavelength of light. 15
- 6(c) A plane grating has 15000 lines per inch. Find the angle of separation of the 5048 Å and 5016 Å lines of helium in the second order spectrum. 10
- 7(a) What is meant by the term polarization of light? Distinguish between ordinary light and polarized light. 10
- 7(b) What is specific rotation? How can you determine specific rotation of sugar solution by means of a polarimeter? 15
- 7(c) A 22 cm long tube containing sugar solution rotates in the plane of polarization by 10.8° . If the specific rotation of sugar solution is 66° , calculate the strength of the solution. 10
- 8(a) Discuss visual angle and angular magnification. 08
- 8(b) Discuss the construction of a compound microscope. Derive an expression for magnifying power of compound microscope. 17
- 8(c) A person has his near point at 15 cm and a range of distinct vision of 85 cm. What is his range of distinct vision when he wears close fitting spectacles having a power of -0.8 diopter? 10

--- End ---

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering
B. Sc. Engineering 1st Year Backlog Examination, 2018

ME 1105
(Thermal Engineering)

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.
iv) Steam table/ Mollier chart and Psychrometric chart may be supplied on request.

SECTION-A

- 1(a) Define energy. What are the differences between conventional and nonconventional sources of energy? 07
- 1(b) State the liabilities and limitations for uses of alternatives to fossil fuel. 08
- 1(c) Describe the ways by which solar energy can convert into mechanical energy. 10
- 1(d) Briefly explain about the geothermal energy and ocean thermal energy. 10
- 2(a) Write down the advantages of using superheated steam. 05
- 2(b) Define phase diagram and sublimation. Draw P-T phase diagram for normal substance and water. 07
- 2(c) What is steam table? Describe the advantages and disadvantages of using steam table over Mollier diagram. 07
- 2(d) A closed vessel of 0.2 m^3 contains steam at a pressure of 10 bar and a temperature of 250°C . The vessel is cooled till pressure of steam in the vessel falls to 3.5 bar. Find the final temperature, final dryness fraction and heat transferred. 16
- 3(a) What is meant by steam generator? What are the essential requirements of a good steam generator? 10
- 3(b) With a neat sketch, explain the working principle of a modern high pressure boiler. 13
- 3(c) What are the differentiating features between a water tube and a fire tube boiler? 12
- 4(a) What are the differences between boiler mountings and boiler accessories? Draw the schematic diagram of a boiler plant. 10
- 4(b) What are the function of Feed check valve, High steam and low water safety valve? Classify superheater. 09
- 4(c) A boiler of an industry gave the following observations: 16
Pressure of steam = 10 bar; Steam condensed = 540 kg/hr; Fuel used = 65 kg/hr, Moisture in fuel = 2% by mass; Mass of the dry flue gas = 9 kg/kg of fuel; lower calorific value of fuel = 32000 kJ/kg; Temperature of flue gas = 350°C ; Temperature of boiler house = 30°C ; Feed water temperature = 50°C ; Mean specific heat of flue gas = 1 kJ/kg K; Dryness fraction of steam = 0.95.
(i) Calculate the equivalent evaporation from and at 100°C ;
(ii) Draw up a heat balance sheet for this boiler.

SECTION-B

- 5(a) Define and explain the different types of fuel. What are the merits and demerits of gaseous fuels? 10
- 5(b) What is meant by stoichiometric air and excess air? Write down the combustion equations of important gaseous fuels. 10
- 5(c) Distinguish between higher and lower calorific value of a fuel. Explain the method used to determine the higher calorific value of fuel by Bomb calorimeter. 15
- 6(a) A certain fuel has the following composition by mass: C 80%, H₂ 10% and S 10%. The volumetric analysis of the flue gas is CO₂ 10%, CO 1%, O₂ 10% and N₂ 79%. Find per kg of coal: (i) the maximum air required, (ii) the actual air supplied, and (iii) the excess air supplied. 15
- 6(b) Why carburetor is used in a SI engine? Explain the operation of a carburetor with neat sketch. 10
- 6(c) Draw and explain the actual indicator diagram of a four stroke cycle petrol engine. 10
- 7(a) Explain the working procedure of a four stroke cycle diesel engine with neat sketches. 13
- 7(b) What is a gas turbine? How does a gas turbine compare with the IC engine power plant? 12
- 7(c) Describe the working principle of vapour absorption refrigeration system with a neat sketch. 10
- 8(a) Define the following terms: (i) COP of refrigerator; (ii) Dew point temperature; and (iii) Sensible heat factor. 09
- 8(b) What are the advantages of vapour absorption refrigeration system over vapour compression refrigeration system? 08
- 8(c) State the properties of a good refrigerant. What are the normal refrigerants used? 08
- 8(d) Explain the working procedure of a summer air conditioning system with neat sketch. 10

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering
B. Sc. Engineering 1st Year Backlog Examination, 2018

Hum 1205
(Economics and Accounting)

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) Discuss the importance of the study of economics. 13
- 1(b) Explain the concept of Economics, Microeconomics and Macroeconomics. 12
- 1(c) Discuss the limitations of macroeconomics. 10
- 2(a) Explain the idea of price elasticity of demand. What determines the price elasticity of demand? 13
- 2(b) Why demand curve downward sloping from left to right? 10
- 2(c) Draw up a demand curve from a hypothetical demand schedule. 12
- 3(a) Briefly explain about market equilibrium. 07
- 3(b) What is competitive market? Draw the cost curves for a competitive firm. For a given price, explain how the competitive firm chooses the level of output that maximizes profit. 18
- 3(c) Under what condition will a firm shutdown temporarily? Explain. 10
- 4(a) Explain the idea of Real GDP and Nominal GDP. Why do economist use real GDP rather than nominal GDP to gauge economic well-being? 12
- 4(b) Explain the idea of inflation, demand pull inflation, and cost push inflation? 18
- 4(d) What is meant by production function? Explain it. 05

SECTION-B

- 5(a) What is accounting process? Describe the steps of recording process. 10
- 5(b) What is transaction? Describe the characteristics of transaction. 10
- 5(c) What is account? What are the classification of accounts under modern system? 10
- 5(d) Describe the elements of accounting equation. 05

- 6(a) What is journal? Discuss the objectives of journal. 10
- 6(b) What are the errors not disclosed by a trial balance? 10
- 6(c) Mr. Nayan opened the Bright cleaners on June 2018. During the first month, the following transaction occurred: 15

- 2018 June-1 Nayan invested Tk 3,00,000 cash in business.
- June-2 Paid Tk 4000 cash for store rent for the month of June.
- June-3 Purchased washers and dryers for Tk 50,000 paying Tk 20,000 in cash and signing a note Tk 30,000.
- June-4 Paid Tk 2,400 for one year accident insurance policy.
- June-5 Received billed from the Ittefaq for advertising the opening of dry cleaners Tk 400.
- June-10 Nayan withdrew Tk 1,400 cash for personal use
- June-12 Cash received for laundry service for Tk 12,400.

Required: Journalize the transactions.

- 7(a) What is ledger? Why ledger is called the king of all books? 10
- 7(b) From the following ledger balances of the campus shop, prepare a trial balance as on December 31, 2017. 25

	Taka
Cash	1,125
Inventory 1-1-17	12,440
Store supplies	845
Office supplies	170
Office equipment	1,280
Accounts payable	3,230
Withdrawals	6,000
Sales returns and allowance	1,435
Prepaid insurance	345
Prepaid rent	550
Store equipment	8,850
Accumulated depreciation - store equipment	3,115
Accumulated depreciation - office equipment	380
Capital	21,530
Sales	69,320
Purchases	41,315
Purchase returns and allowances	725
Transportation-in	955
Salaries expense	15,765
Rent expense	6,050
Advertising expense	810
Utilities expense	365

JACK and ROWS
Trial Balance as on 31st December 2017

Account Titles	Debit (Taka)	Credit (Taka)
Cash.....	5,400	
Accounts Receivable.....	2,800	
Prepaid Insurance.....	2,400	
Supplies.....	1,300	
Equipment.....	60,000	
Notes payable.....		40,000
Accounts payable.....		2,400
Jack and Rose, Capital.....		30,000
Jack and Rose, Drawing.....	1,000	
Fees earned.....		8,500
Salaries expense.....	3,200	
Utilities expense.....	800	
Advertising expense.....	4,000	
	80,900	80,900

Additional information:

- (i) Insurance expires at the rate of Tk 200 per month.
- (ii) There are Tk 1,000 of supplies on hand of December 31, 2017.
- (iii) Monthly depreciation is Tk 1,000 on the equipment.

Required: Prepare financial statement for the month of December 2017

- (a) Statement of comprehensive income at the end of December 2017.
- (b) Statement of owner's equity and
- (c) Statement of financial position as on December 31, 2017.