KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Mechanical Engineering
B. Sc. Engineering 2nd Year Backlog Examination, 2021
ME 2221
(Computer Programming)

Time: 3 Hours. Full 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) What is meant by operator precedence? What are the relative precedence of arithmetic operators? Explain with example. 08

1(b) Explain the following with example in terms of *C* language: 18

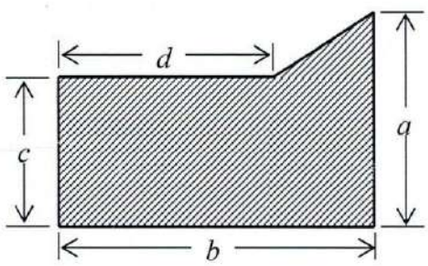
(i) Identifiers, (ii) Keywords, (iii) Operands, (iv) Expression, (v) Function, and (vi) Escape sequence.

1(c) Write a *C* code to identify odd and even numbers. 09

2(a) What is meant by control statement? Explain three control statements with example. 11

2(b) Write a *C* program to find the sum of any 100 numbers that are integers and divisible of 5 only. 12

2 (c) Find the area of the following shape using *C* program for the dimensions given as the program input. 12



3(a) Explain the purpose of the following with example: 12

(i) Switch statement, (ii) Nested if-else statements, (iii) Break statement, and (iv) Continue statements.

3(b) The income tax is calculated according to the following slabs: 23
If income is $\leq$ 3 lac; tax is 0
income is > 3 lac but < 5 lac; tax is 5% of income.
income is > 5 lac but $\leq$ 10 lac; tax is 10000 + 10% of income above 5 lac.
income is > 10 lac; tax is 60000 + 15% of income above 10 lac.
Write a program to calculate income tax of a person given his income.

4(a) How an array differs from an ordinary variable? What condition must be satisfied by all elements of any given array? Briefly explain the syntax of multidimensional array. 10

4(b) Calculate the sum of the diagonal elements of a square matrix by *C* program. 10

4(c) Given two matrices A ($m \times n$) and B ($m \times n$) write a program to multiply each element of A by the corresponding element of B. 15

SECTION – B

5(a) What is meant by string? How does string differ from array? Write 5 string functions with their respective purposes. 12

5(b) You are given an english sentence of 100 characters. Write a program to calculate the number of '*a*', '*e*', '*i*', and '*o*' in the sentence. 15

5(c) What are static and dynamic memory allocations? Explain the use of (i) malloc (), and (ii) calloc () functions. 08

6(a) What is meant by function prototyping? Is it possible to write a program avoiding function prototyping? Explain with example. 10

6(b) Write a user-defined function to check prime number and use the UDF to find out the prime numbers between 1 to 200. 15

6(c) What is recursion? Write a recursive user-defined function to calculate the factorial of an integer. 10

7(a) Define an appropriate structure to store the information of 2nd year mechanical students. The information contains name, roll, year, hall address and birth date. 10

7(b) Write a *C* program using structure to print the information of *n* customers of a bank. The information include the name, age, account number, account type and account balance assuming these information are stored in the bank data base. 18

7(c) What is meant by printer variable? What are its advantages and disadvantages? 07

8(a) What are the primary advantages of using data file in C programming.
Define pointer and why is it used? 05

8(b) Write down the use of the following library functions: 15

(i) printf (), (ii) fscanf (), (iii) gets (), (iv) fputs (), and (v) fopen ().

8(c) Write a *C* program to calculate the total class test marks from 3 class test examinations of 120 students. Store the total marks to a data-file as output. 15

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 2rd Year Backlog Examination, 2021

EE 2105

(Electronics)

Time: 3 Hours | Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
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iii) Assume reasonable data if any missing.

SECTION-A

1(a) Define semiconductor and *p-n* junction. Draw and explain the V-I characteristics of a *p-n* junction. 10

1(b) What is meant by rectification? Why we need rectification? Explain different types of rectifiers? 13

1(c) Briefly describe the following diodes: 12
(i) Shockley diode, (ii) LED, (iii) Varactor diode, and (iv) Tunnel diode.

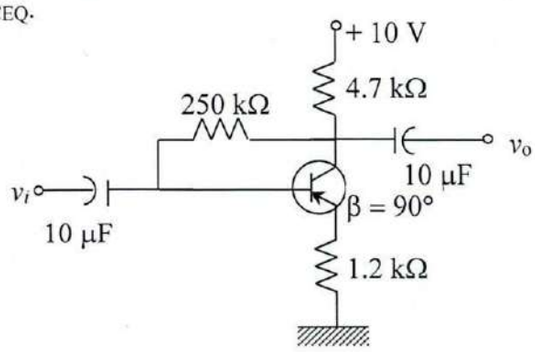
2(a) Explain how Zener diode acts as a voltage regulator. 10

2(b) What is BJT? Explain the operation of a *npn* transistor. 12

2(c) "A BJT can be used as an amplifier"– Justify the statement. Show that BJT can be used as a switch. 13

3(a) Draw the following configuration of transistor as amplifier with load: 09
(i) Common-emitter, (ii) Common-base, and (iii) Common-collector.

3(b) A dc bias with voltage feedback network is shown in figure. Determine the quiescent levels of I_{CQ} and V_{CEQ}. 13



3(c) What is biasing? How can we bias BJT in active region? Briefly explain different operating regions of a transistor. 13

4(a) What is electrical resistance welding? Draw the basic circuit arrangement of ac electrical resistance welding and describe its different parts. 13

4(b) Mention some applications and advantages of UJT. A UJT has 10 V between the bases. If the intrinsic stand off ratio is 0.65, find the value of stand off voltage and also find the value of peak point voltage for $V_D = 0.7$ V. 10

4(c) Draw the block diagram of a regulated power supply and explain briefly the different parts with wave shapes. 12

SECTION-B

5(a) What is meant by "Maxterm" and "Minterm" in Boolean algebra? State and explain the Duality principle and De-Morgan's theorem. 13

5(b) Write the name of graphic symbols, algebraic functions and truth table of different logic gates. 10

5(c) Implement the following Boolean functions with minimum number of gates. 12

$F_1 = x\,y + x'\,z + y\,z$

$F_2 = y\,z + x\,z' + x\,y + y\,z\,w$

6(a) Design a BCD to excess-3 code converter with logic equation and necessary logic gates. 13

6(b) What are the universal gates? Why are they named so? Implement the following function with NAND gates. 12

$F(x, y, z) = \sum (0, 6)$.

6(c) Show that "A full-adder can be implemented with two half-adders and one OR gate". 10

7(a) Define transducer. Describe different types of temperature measurement devices. 10

7(b) What is meant by instrumentation? Mention different components of a typical instrumentation system. 10

7(c) Define sequential logic circuits. Describe J-K and D flip flops with net sketches and characteristic tables. 12

7(d) Define counter. 03

8(a) What are the different types of communication? Define them and write the differences between analog and digital communication. 05

8(b) Define integrated circuit. Classify it and write advantages and disadvantages of integrated circuit. 10

8(c) What is microprocessor? Draw the internal architecture of an 8085 microprocessor. 10

8(d) What is shift register? Design a 4-bit serial transfer shift register. 10

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 2nd Year Backlog Examination, 2021

ME 2211

(Mechanics of Solid)

Time: 3 Hours | Total Marks: 210

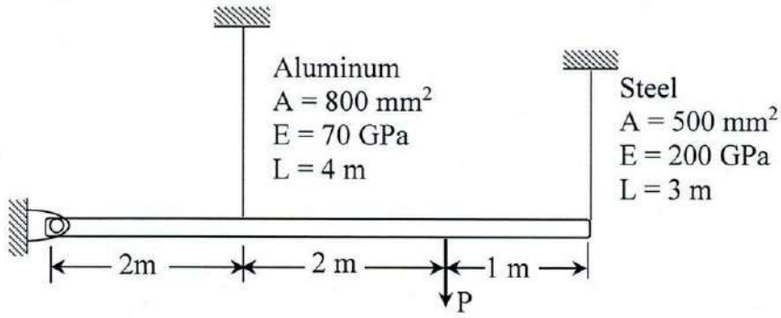
N.B.: i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.
iv) Necessary table may be supplied on request.

SECTION-A

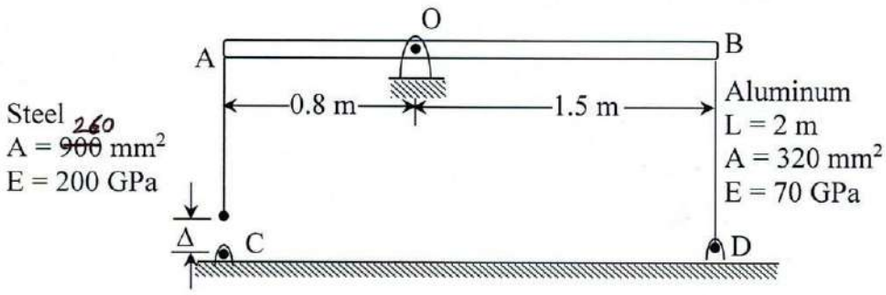
1(a) Define and explain the following terms: 06
(i) Normal stress, (ii) Bearing stress, and (iii) Poisson's ratio.

1(b) Prove that the axial stress of a thin-walled cylindrical pressure vessel is half of the Hoop stress. 12

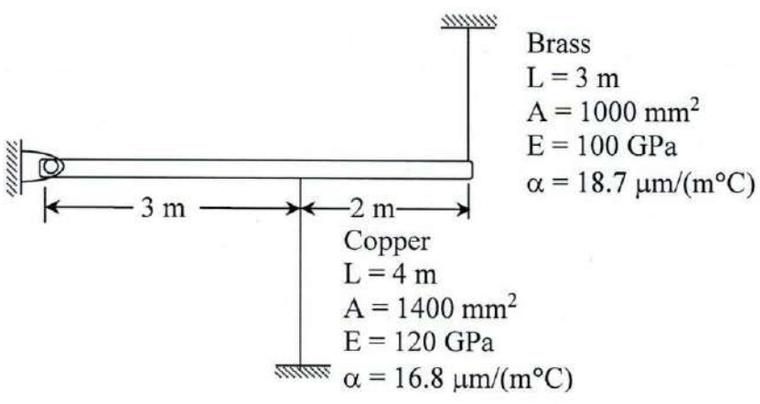
1(c) A rigid beam with negligible mass as shown in figure is pinned at one end and supported by two rods. The beam was initially horizontal before the load P was applied. Find vertical movement of P, if P = 100 kN. 17



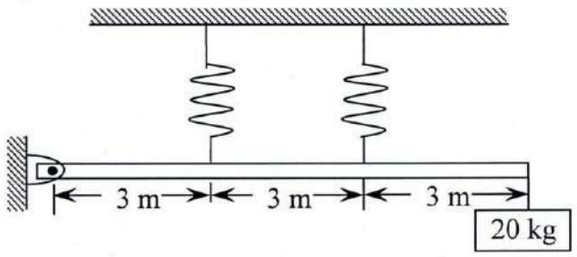
2(a) The assembly as shown in the figure consist of a light rigid bar AB, pinned at O that is attached to the steel and aluminum rods. In the position shown, bar AB is horizontal and there is a gap, Δ = 6 mm, between the lower end of the steel rod and its pin support at C. Compute the stress in the aluminum rod when the lower end of the steel rod is attached to its support. 18



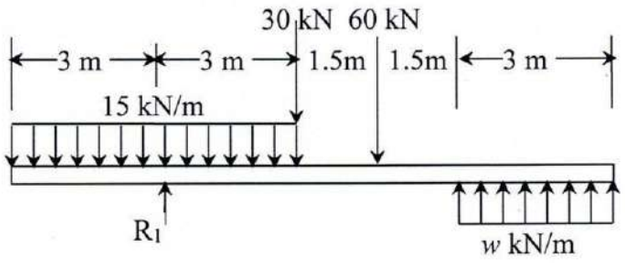
2(b) A rigid horizontal bar of negligible mass is connected to two rods as shown in figure. If the system is initially stress free, calculate the temperature change that will cause a tensile stress of 100 MPa in the brass rod. Assume that both rods are subjected to the change in temperature. 17



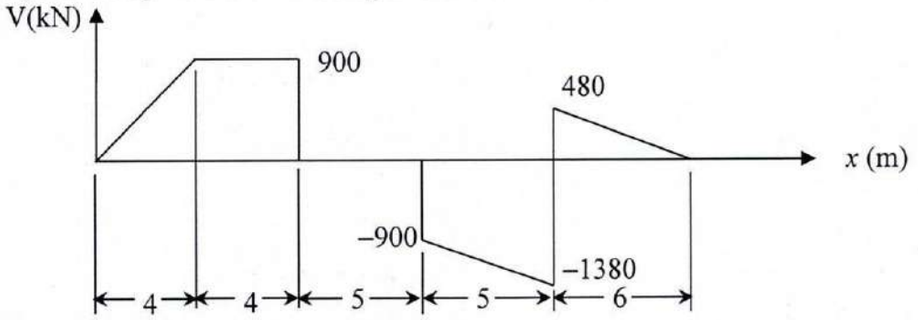
3(a) A rigid bar, hinged at one end is supported by two identical springs as shown in figure. Each spring consists of 25 turns of 15 mm wire having a mean diameter of 200 mm. Compute the maximum shearing stress in the springs. Neglect the mass of the rigid bar. 17



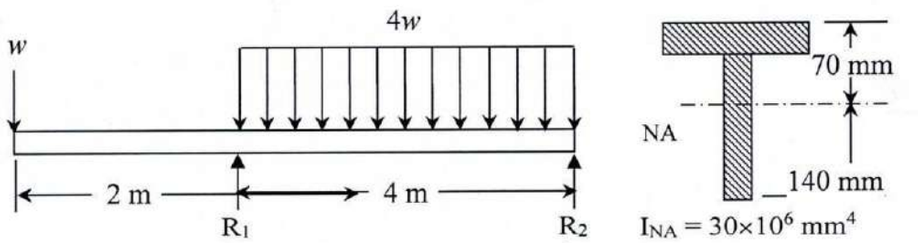
3(b) Without writing shear and moment equations, draw shear and moment diagrams for the beam as shown in figure. Give numerical values at all change of loading positions and at all points of zero shear. 18



4(a) Draw moment and load diagrams corresponding to the shear diagram as shown. Specify values at all change of load positions and at all points of zero shear. 18

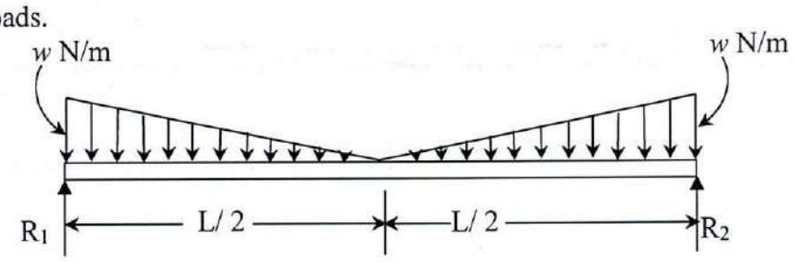


4(b) A beam carries a concentrated load w and a total uniformly distributed load of $4w$ as shown in figure. What safe value of w can be applied can be applied if $\sigma_c \leq 120$ MPa and $\sigma_t \leq 70$ MPa? Can a greater load be applied if the section is inverted? Explain. 17

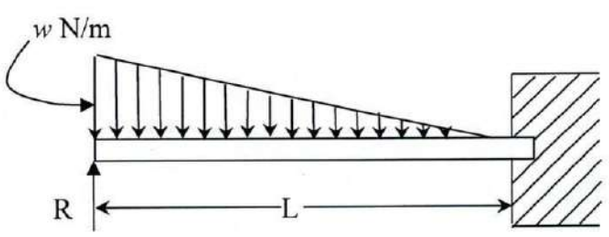


SECTION-B

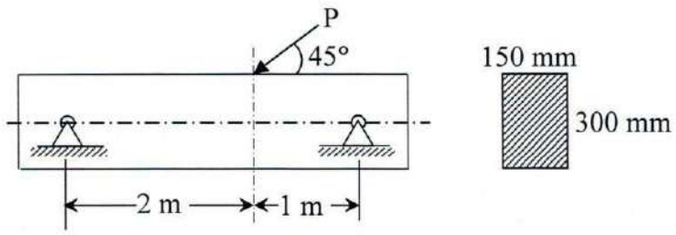
5(a) Find the midspan deflection δ for the beam as shown in figure carrying two triangularly distributed loads. 18



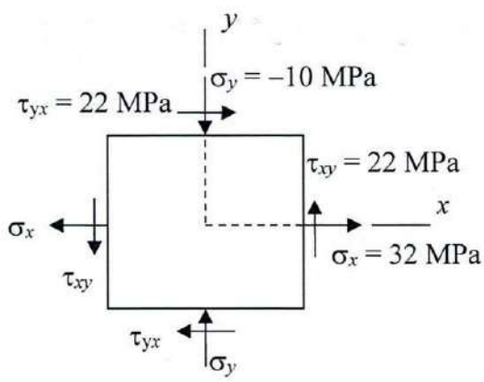
5(b) For the propped beam as shown in figure, determine the reaction R and sketch the shear and moment diagrams 17



6(a) A wooden beam, supported as shown in figure, carries a load P. What is the larger safe value of P if the maximum stress is not to exceed 20 MPa? 15



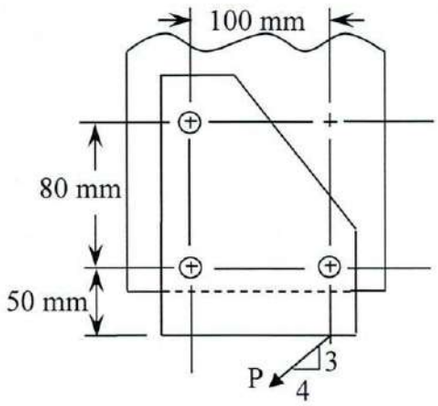
6(b) A state of stress is specified in the figure. Determine the normal and shearing stresses on (i) the principal planes, (ii) the planes of maximum in-plane shearing stress, and (iii) the plane whose normal are at 35° and 125 ° with x-axis. Show all results on complete sketches of differential elements. 20



7(a) Derive the expression of critical load for long column by following Euler's method. Also show that critical load of a column with one end fixed and other hinged is twice the critical load of a hinged column. 17

7(b) A steel column with an effective length of 12 m is fabricated from two C250×45 channels latticed together so that the section has equal moment of inertia about the principal axis. Determine the safe load using AISC specifications. Use $\sigma_{YP} = 400\ MPa$. 18

8(a) For the riveted connection as shown in figure, determine the allowable load P if the shearing stress in 30 mm rivets is limited to 150 MPa. 17



8(b) A 16 mm plate is lapped over and secured as shown in figure by transverse fillet welds on the inside and outside to form a penstock 1.6 m in diameter. Determine the safe internal pressure, assuming allowable stress of σ_t = 150 MPa for the plate and τ = 110 MPa through the throats of the welds. Use the maximum size of welds permitted. 17