1-1

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring 2023
Program: B. Sc. Engineering (Civil)

Course Title: History of Bangladesh Independence, Society and Culture | Course Code: HSS 105
Time: 03 hours | Credit Hours: 03 | Full Marks: 150

Use separate answer scripts for Part-A and Part-B. All questions are of equal value. Figures in the right margin indicate marks.

Answer the following questions.

Part - A

1. Write an essay on the language movement of 1952. 30

2. Explain about the Six-point program of 1966. 30

3. Write a short note on the mass upsurge in 1969. 15

OR

4. Write a short note on the Liberation War of Bangladesh in 1971. 15

Part - B

5. a. What do you understand by social change? Discuss the sources of social change with examples. 15
   b. Discuss the origin and development of sociology. 15

6. a. What is social order? Discuss how we learn social order. 15
   b. Discuss the contribution of European scholars in Sociology. 15

7. Define and distinguish between industrial and post-industrial society. 15

OR

8. Define capitalism and socialism. Discuss the different features of capitalism and socialism. 15

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University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination, Spring 2023
Program: B.Sc. in Civil Engineering

Course Title: Mathematics-I | Course Code: MTH 101

Time: 3.00 Hours | Credit: 3.00 | Full Marks: 150

There are **eight (8) questions**. Answer **six (6) including Q1, Q2, Q3 and Q4**. Figures given in the right margin indicate the marks of the respective questions.

1. a. Integrate the following: **15**

i) $\int \frac{x+1}{x^2-7x+10}\,dx$ ii) $\int \frac{\cos x}{\sin x+2\cos x}\,dx$ iii) $\int \frac{dx}{(3x+2)\sqrt{2x+1}}$

b. Evaluate $\lim_{n\to\infty}[\frac{1^2}{n^3+1^3}+\frac{2^2}{n^3+2^3}+\frac{3^2}{n^3+3^3}+\cdots+\frac{n^2}{n^3+n^3}]$. **10**

2. a. Obtain the reduction formula for $\int_0^{\frac{\pi}{4}} \tan^n x\,dx$. Use the formula to evaluate $\int_0^{\frac{\pi}{4}} \tan^8 x\,dx$. **15**

b. Show that $\int_0^1 \frac{x^6}{\sqrt{1-x^2}}dx = \frac{5\pi}{32}$. **10**

3. a. If $w = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, show that $x\frac{\partial w}{\partial x}+y\frac{\partial w}{\partial y} = \tan w$. **15**

b. If $y = (ax+b)^m$, find y_n. **10**

4. a. If $y = \sin^{-1} x$ then show that **15**
$(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2y_n = 0$.

b. Find the absolute maximum and minimum values of the function **10**
$f(x) = 2x^3 - 15x^2 + 36x$ on the interval $[1, 5]$.

5. a. Use a double integral to find the volume of the solid that is bounded above by the plane $z = 4 - x - y$ and below by the rectangle $R = [0,1] \times [0,2]$. **15**

b. Prove that $\int_0^\infty e^{-x^2}\, dx = \frac{\sqrt{\pi}}{2}$. **10**

OR

6. a. Evaluate $\iint_D (x + 2y)\, dA$, where D is the region bounded by the parabolas $y = 2x^2$ and $y = 1 + x^2$. **15**

b. Evaluate the improper integral $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}\, dx$. **10**

7. a. Find the area of the surface generated by revolving the curve $x^2 + y^2 = 4$ about the X axis between $x = -1$ and $x = 1$. **15**

b. Show that $\int_0^{\frac{\pi}{2}} Log \sin x\ dx = \frac{\pi}{2}\ Log\frac{1}{2}$. **10**

OR

8. a. Find the whole area of the cycloid $x = a(\theta + \sin\theta)$, $y = a(1 - cos\theta)$ bounded by its base. **15**

b. Find the perimeter of the cardioid $r = a(1 - \cos\theta)$. **10**

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring 2023
Program: B.Sc. in Civil Engineering

Course Title: Physics I | Course Code: PHY 101
Time: 3.0 hours | Credit Hour: 3.0 | Full Marks: 150

There are **eight** questions. Answer **six** including **questions 1, 2, 5 and 6**. Figures in the right margin indicate marks.

1. **a)** Describe stream line motion. Show that for a liquid in stream line motion, **5+15**

$$P + \frac{1}{2}\rho v^2 + \rho g y = \text{constant}$$

where the symbols have their usual meanings.

b) Oil flows through a pipe 8.0 cm in diameter at an average speed of 4.0 $\frac{m}{s}$. **5**
Determine the flow rate in m^3/s and m^3/h.

2. **a)** State and explain first law of thermodynamics. **5**

b) Explain isothermal process. Calculate the work done during an isothermal process. **5+15**

3. **a)** Show that for a particle executing simple harmonic motion, the instantaneous velocity is $\omega\sqrt{A^2 - y^2}$ and instantaneous acceleration is $-\omega^2 y$. **10**

b) When a simple harmonic wave is propagated through a medium, the displacement of a particle (in cm) at any instant of time is given by **10**

$$y = 10 \sin\frac{2\pi}{100}(36000t - 20)$$

Calculate the amplitude, wave velocity, wavelength, frequency and time period of the vibrating particle.

c) Differentiate between transverse and longitudinal wave. **5**

OR

4. **a)** Show that closed end organ pipes have odd harmonics only and hence the value of n^{th} harmonic frequency will be $(2n + 1)f_1$. **20**

b) Distinguish between progressive and stationary wave. **5**

5. **a)** Show that the fringe width between two consecutive dark fringes is $X = \frac{\lambda D}{d}$, where the symbols have their usual meanings. **20**

b) Light from a sodium vapor lamp forms an interference pattern on a screen 0.8 m from a pair of slits. The bright fringes in the pattern are 0.35 cm apart. What is the slit separation? **5**

6. **a)** Define periodic motion. Establish that the total energy of a vibrating particle is equal to $2\pi^2 ma^2 n^2$. **5+10**

b) A simple harmonic motion is represented by the equation **10**

$$y = 10 \sin\left(10\,t - \frac{\pi}{6}\right)$$

Calculate its

i) frequency
ii) time period
iii) maximum displacement
iv) maximum velocity.

7. **a)** Describe Carnot cycle with diagram. **20**

b) Find the efficiency of a Carnot's engine working between the temperature 227^0C and 27^0C. **5**

OR

8. **a)** Show that PV^γ = constant for adiabatic process, where the symbols have their usual meanings. **20**

b) A quantity of air at 27^0C and atmospheric pressure is suddenly compressed to half of its original volume. Find the final pressure. [$\gamma = 1.4$] **5**

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2023
Program: B. Sc. Engineering (Civil)

Course Title: Engineering Mechanics | Credit Hours: 3.0 | Course Code: CE 101
Time: 3 hours | Full Marks: 100 (10 × 10)

ANSWER ALL THE QUESTIONS

1. In the truss loaded as shown in ***Fig.1***, (i) identify the zero force members, (ii) calculate the reactions at supports o and r, and (iii) calculate forces in members ***mn, qr*** and ***mr***.

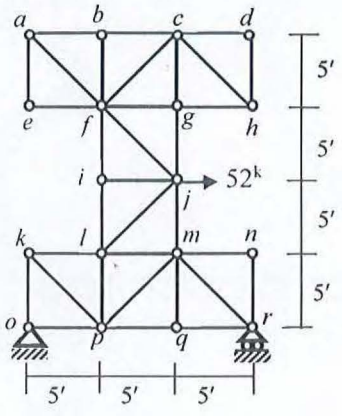


Fig.1

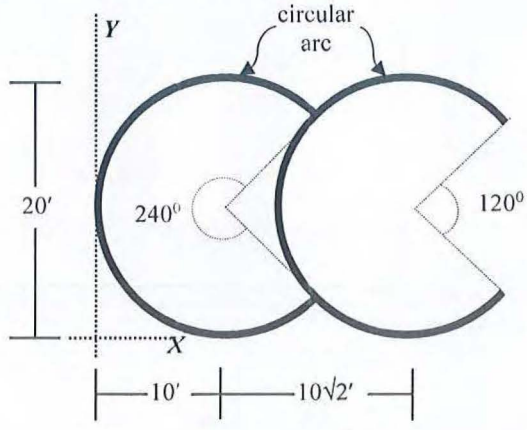


Fig.2

2. Locate the centroid of the composite line (shown in ***Fig.2***) with respect to the given co-ordinate system.

3. For the frame ***abcde*** loaded as shown in ***Fig.3***, calculate the (i) reactions of supports ***b*** and ***d*** and (ii) shear force and bending moment at ***c*** (mid-point of member ***bd***).

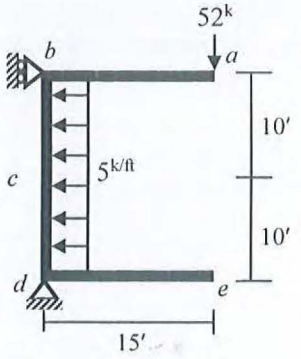


Fig.3

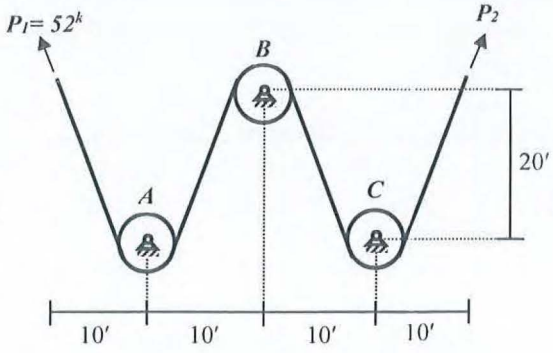


Fig.4

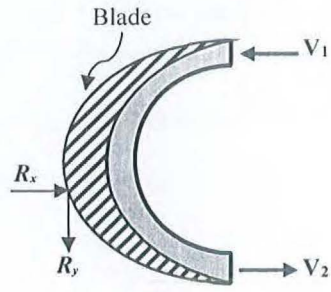


Fig.5

4. Determine the value of $P_{2(min)}$ in ***Fig.4*** that will cause impending motion towards the direction of P_2 [Given, $f_A = f_B = f_C = 0.2$].

5. A jet of steam issued from a nozzle with a velocity of V_1 fps and an absolute rate of 5.1 lb. per sec. It enters a fixed blade which is shaped shown in ***Fig.5*** and has a negligible frictional loss. Calculate the horizontal and vertical components of the force exerted upon the fixed blade.

6. Compute the minimum moment of inertia I_{min}, and the maximum moment of inertia I_{max} about the centroidal axes of the shaded area shown in ***Fig.6***.

7. If the thickness of the composite area shown in ***Fig.6*** is 2 ft, calculate the mass moment of inertia of the composite mass with respect to the given co-ordinate system [Given, Unit weight of the object, $\gamma = 150$ lb/ft^3].

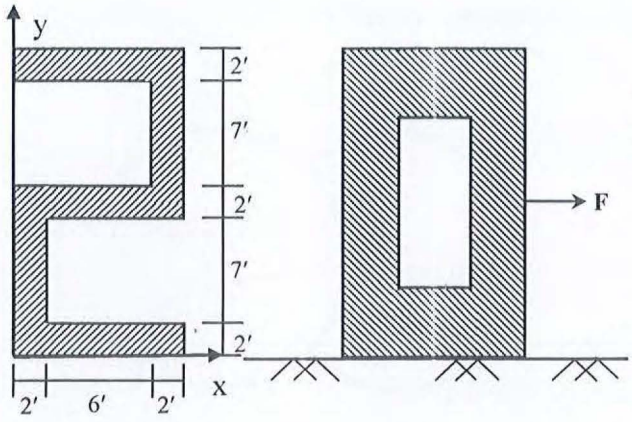


Fig.6

Fig.7

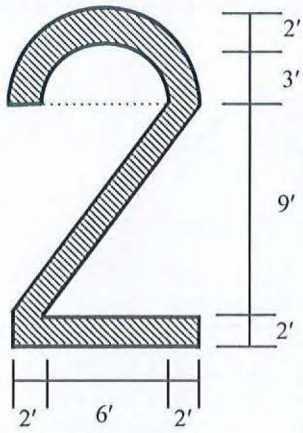


Fig.8

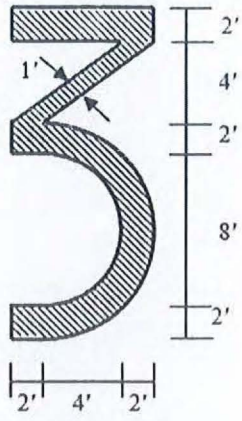


Fig.9

8. A block weighing 510 lb is resting on a surface and is pulled rightward by a horizontal force F as shown in ***Fig.7***. If the body starts from rest and after 10 seconds its velocity is 20 ft/second, calculate the applied force F and net work done in 10 seconds [Coefficient of static friction between the block and the surface = 0.20].

9. A particle is moving with rectilinear motion such that the acceleration $a = 5.2t$ ft/s^2. The initial and final velocity of the particle are 10 ft/s and 20 ft/s, respectively. Calculate the required time and distance travelled by the particle.

10. Locate the centroid of the composite area shown in ***Fig.8*** Or ***Fig.9.***

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2023
Program: B.Sc. Engineering (Civil)

Course Title: Introduction to Civil and Environmental Engineering — Course Code: CE 107
Time: 2 Hours — Credit Hours: 2.00 — Full Marks: 100

(Answer all the questions. Figures in the right margin indicate marks)

1. a) Discuss the effect of climate change on Bangladesh. [10]

   b) Explain what factors make Bangladesh more vulnerable during flood. [5]

2. a) Define ecology and ecosystem. Describe the purposes of studying ecology. [4+6]

   b) Explain ecosystem hierarchy in brief. [5]

3. a) Discuss the purpose of soil test and site classification. [5]

   b) Discuss the components of soil test briefly. [10]

4. a) Define biodiversity hotspot. Explain why we need to protect biodiversity. [3+3]

   b) Discuss the types of biodiversity and identify the direct benefits of biodiversity. [4+5]

5. a) Classify field survey based on the instruments used and discuss any two of them. [3+4]

   b) Differentiate between national highway and regional highway. [5]

   c) Briefly describe different types of structural loads. [8]

6. A five-storied residential building is to be constructed. Estimate the total construction cost as per the PWD schedule. The particulars of the building are as follows: [20]

Serial No	Particulars	Specification
1	Land Size	Determine from plot layout as shown in Figure 1
2	Building type	Residential (Standard)
3	Allowable Bearing Capacity (q_a)	4 ksf
4	Floor Level	Five
5	Plinth Area	70 % of land size
6	Construction Material	24 MPa, RCC Structure 1: 1.5 : 3 (Stone Chips)
7	Ground Floor	Car Parking
8	Rooftop RCC water tank	1500 Gallon
9	Structure type	RCC Frame Structure
10	Underground water reservoir	4000 Gallon
11	Boundary wall	RCC Frame
12	Contingency Cost	Consider 10 % for this building

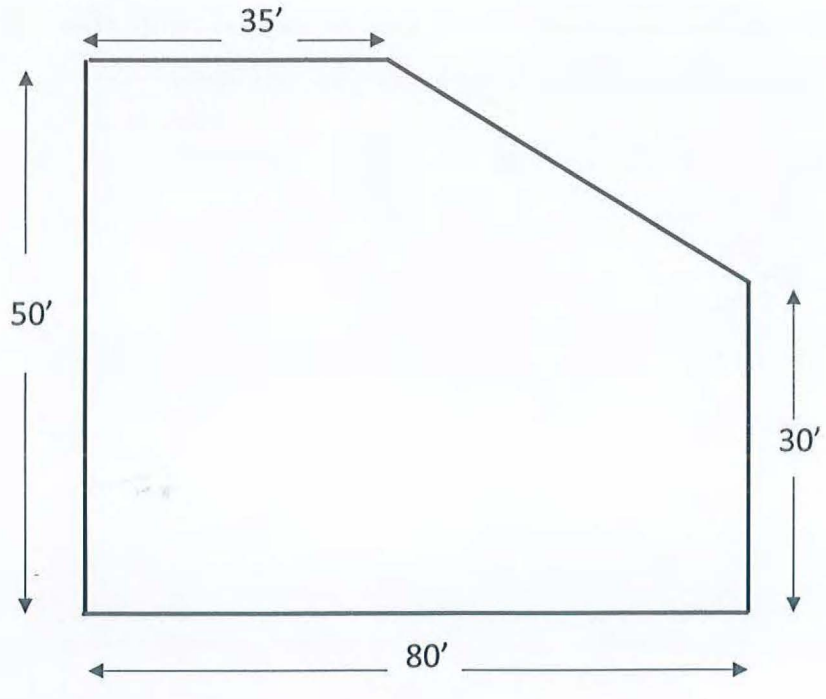


Figure 1

Annexure: PWD SCHEDULE

1. Foundation Cost upto PL (per m^2 of Plinth Area)

Storey	q_a= 2 ksf	q_a = 2.50 ksf	q_a = 3.0 ksf	q_a = 3.5 ksf	q_a = 4.0 ksf	q_a = 4.5 ksf	q_a = 5.0 ksf
1	3982	3875	3811	3769	3740	3718	3702
2	4684	4381	4199	4080	3997	3936	3830
3	5591	5036	4702	4482	4329	4217	4133
4	6566	5811	5296	4958	4723	4551	4421
5	8001	6774	6035	5550	5212	4965	4778
6	9495	7851	6862	6213	5759	5429	5178
7	10961	8908	7673	6862	6296	5883	5571
8		10043	8544	7560	6873	6371	5992
9		11252	9471	8302	7487	6891	6441
10		12529	10451	9088	8136	7441	6915

2. Superstructure Cost (per m^2 of Plinth Area)

Building Category													
		Non-Residential (fc=19-21 MPa, Brick Chips)			Residential (fc=19-21 MPa, Brick Chips)			Non-Residential (fc=22-25 MPa, Stone Chips)			Residential (fc=22-25 MPa, Stone Chips)		
Level	Floor	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior
0	GF Park	5449	5812	6538	5634	6010	6761	5922	6317	7107	6124	6532	7349
0A	Habitation	8545	9601	12674	8837	9929	13106	9020	10135	13378	9631	10792	14274
1	1 st Floor	8242	9360	12224	8523	9576	12640	8699	9776	12903	9289	10409	13767
2	2nd Floor	8365	9399	12407	8651	9720	12830	8830	9921	13096	9568	10565	14180
3	3 rd Floor	8491	9540	12593	8780	9866	13023	8962	10070	13293	9855	10723	14606
4	4 th Floor	8618	9683	12782	8912	10014	13218	9097	10221	13492	10151	10884	15044
5	5 th Floor	8748	9829	12974	9046	10154	13416	9233	10374	13694	10455	11046	15495
6	6 th Floor	8835	9927	13104	9136	10265	13550	9326	10478	13831	11030	11158	15960

3. Boundary Wall: Tk.3500/m
4. External Water Supply: Tk.60.00/gallon
5. Gas Connection:
   - GF: Tk.260/sqm
   - Other floors: Tk.100/sqm
6. Internal Electrification:
   (i) Residential Building
   - Economy: Tk.1030 /sqm
   - Standard: Tk.1290 /sqm
   - Superior: Tk.1550 /sqm

   (ii) Non- Residential Building
   - Economy: Tk.775 /sqm
   - Standard: Tk.970 /sqm
   - Superior: Tk.1160 /sqm
7. Internal Sanitary and Water Supply:
   (i) Residential Building
   - Economy: Tk. 475 /sqm
   - Standard: Tk.715 /sqm
   - Superior: Tk. 1070 /sqm

   (ii) Non-Residential Building
   - Economy: Tk.360 /sqm
   - Standard: Tk.540 /sqm
   - Superior: Tk.800 /sqm
8. Floor Finish Work: Tk.1000.00/ sqm
9. Roof top RCC water Tank: Tk.85.00/gallon

University of Asia Pacific

Department of Civil Engineering

Semester Final Examination, Spring – 2023

Program: B.Sc. in CE (1st Year, 1st Semester)

Course Title: Basic Electrical and Electronic Engineering | Course Code: ECE 101 | Credit Hours: 3.00

Time: 3 hours | Full Marks: 150

[There are **eight (8)** questions. Answer any **six (6) including Q1-Q4**. Figures in the right margin indicate marks]

1. For the circuit give in figure 1, where all resistances are of equal value, $R = 5\ \Omega$, determine: [5+5+5+5]

i) The equivalent resistance R_{eq}.

ii) The current I_s.

iii) The current I_1 & I_2.

iv) The voltage V_O.

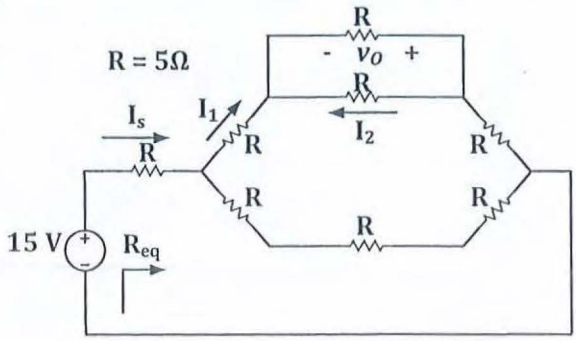


Figure 1

2. a. Using nodal analysis, determine all the node voltages in figure 2. [12.5]

b. Using mesh analysis, determine all the mesh currents in figure 2. [12.5]

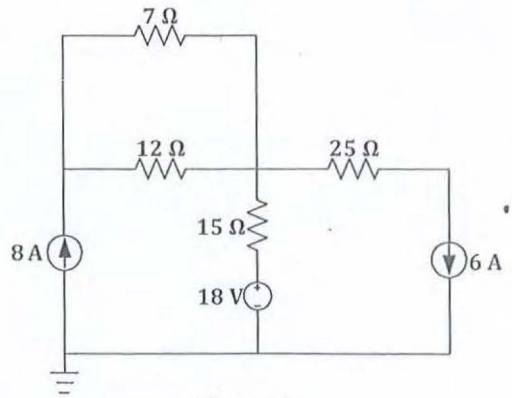


Figure 2

3. a. Calculate the equivalent capacitance C_{eq} in figure 3. [10]

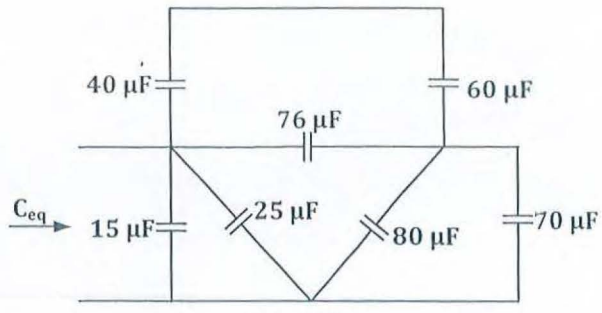


Figure 3

b. For figure 4. [5+5 +2.5+ 2.5]

i) Determine the value of i_L and v_c.

ii) Calculate the energy stored in the inductor.

iii) Calculate the energy stored in the capacitor.

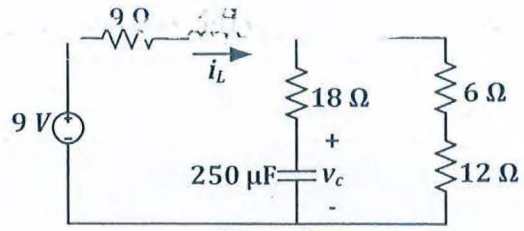
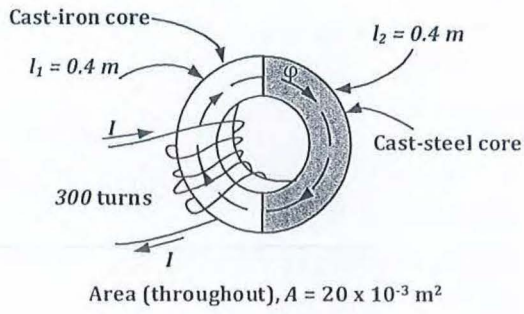


Figure 4

4. For the series magnetic circuit given in the figure 5, determine: [15 +10]

i) the current I required to develop a flux of $\varphi = 4 \times 10^{-3} Wb$.

ii) μ & μ_r of the two materials.



Area (throughout), $A = 20 \times 10^{-3}\ m^2$

Figure 5

5. Using superposition theorem to determine voltage V_o in figure 6. [25]

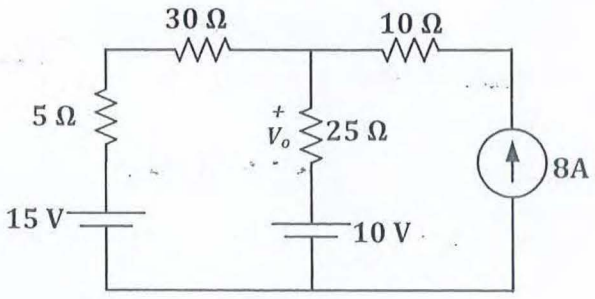


Figure 6

OR

6. For the circuit given in figure 7, [15+5 +3+ 2]

i) Draw the Thevenin's equivalent circuit at the terminal marked a and b. ($a - b$ are the load terminals)

ii) Draw the Norton's equivalent circuit.

iii) Determine the value of R_L for maximum power transfer and the value of maximum power.

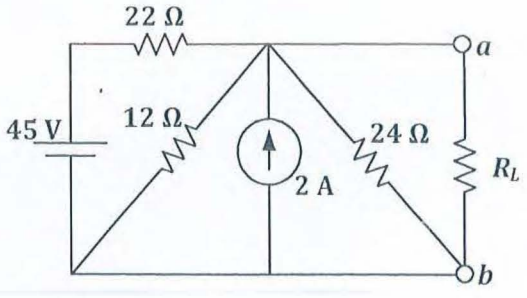


Figure 7

7. **a.** The current though a capacitor, $C = 2\ \mathbf{mF}$ is given by, [4+3

$$i = 4\sin(100t + 50)A$$

i) Determine the expression for the voltage, v.

ii) Sketch v and i on the same axis.

b. Find the average and the R.M.S value of the wave shape given in figure 8. [7.5+7.5]

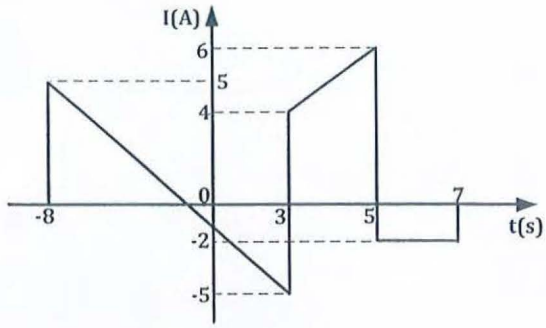


Figure 8

OR

8. For the circuit given in Figure 9, determine:
i) Z_T
ii) I_s
iii) I_1 & I_2
iv) v_1 & v_2
v) Power factor
vi) Power delivered to the circuit [5+3+5+5 3+4]

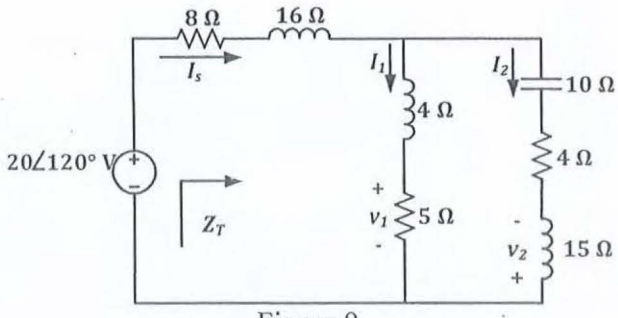
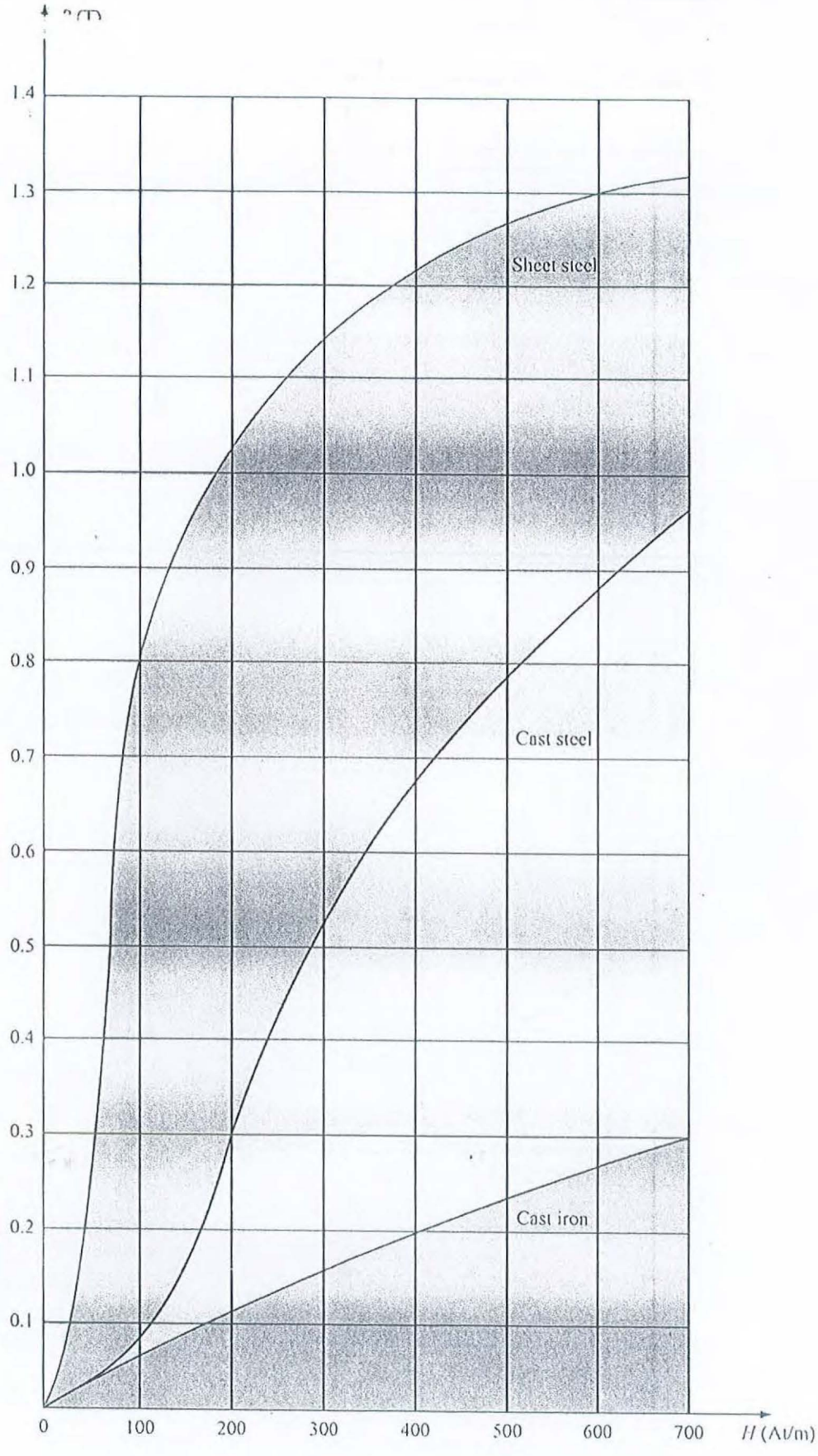


Figure 9


B (T)
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Sheet steel
Cast steel
Cast iron
0
100
200
300
400
500
600
700
H (At/m)