



RTC INSTITUTE OF TECHNOLOGY
(Approved by AICTE, New Delhi, and Affiliated to Jharkhand
University of Technology & Ranchi University, Ranchi) Anandi,
Ormanjhi, Ranchi-835219, Jharkhand

MSE-I [Provisional]

Session-2023-24

Question SET- A

Semester: 1st

Course: B. Tech

Branch: CSE+EEE+ECE

Subject: Basics of Electrical Engineering

Code: FSEE1

Answer any five questions [Question No. 1 is compulsory].

Duration: 90 Minutes

Each question is of equal weightage [4Marks].

F.M: 20 Marks

Q<1 MCQ Type [Choose correct answer]

(i) Mesh analysis is generally used to determine _____

- a. Voltage
- b. Current
- c. Resistance
- d. Power

(ii) In superposition theorem, when we consider the effect of one current source, all the other voltage sources are _____

- a. Shorted
- b. Opened
- c. Removed
- d. Undisturbed

(iii) Nodal analysis is generally used to determine _____

- a. Voltage
- b. Current
- c. Resistance
- d. Power

(iv) In superposition theorem, when we consider the effect of one voltage source, all the other voltage sources are _____

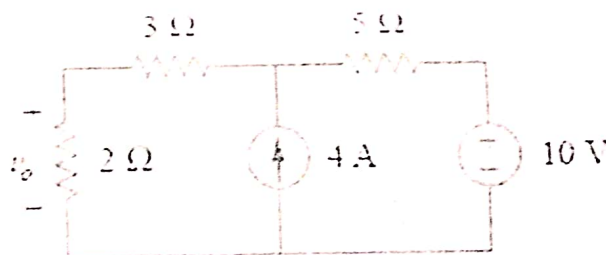
- a. Shorted
- b. Opened
- c. Removed
- d. Undisturbed

Qs 2. State and explain Maximum power transfer theorem.

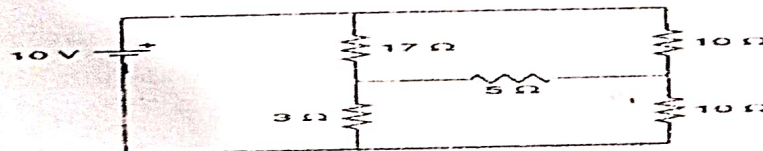
Qs 3. Define the following: (a) Peak Value (b) RMS Value (c) Average value (d) cycle

Qs 4. Define Power factor in AC Circuit.

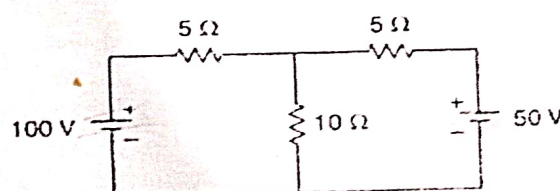
Qs 5. Using the principle of superposition, calculate the current I in the network shown in fig :-



Qs 6. Find the current through the 5 ohm resistor in the network of figure using Thevenin's theorem



Qs 7. Compute the current in the 10 ohm resistor as shown in figure using superposition theorem





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MSE-I [Under JUT]

Semester: 1st

Subject: Engineering Mathematics-I

Answer any five questions [Question No. 1 is compulsory]

Each question is of equal weight-age [4Marks]

Session-2023-24

Course: B.Tech.

Question SET-A

Branch: All

Code: BSM 01

Duration : 90 Minutes

F.M: 20 Marks

Qs.1. MCQ Type [Choose correct answer]

(i) If $u = \sin^{-1} \frac{x^2+y^2}{x+y}$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$

(a) $2u$ (b) u (c) $\tan u$ (d) $\sin u$

(ii) If $f(x, y) = \tan^{-1} y/x + \sin^{-1} x/y$, then $x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y} =$

(A) 1 (B) 2 (C) -1 (D) 0

(iii) $\text{Div}(\text{curl } F) = ?$

(a) 1 (b) -1 (c) 0 (d) none

(iv) The value of $\frac{\partial(u,v)}{\partial(x,y)} \cdot \frac{\partial(x,y)}{\partial(u,v)}$ is

(a) -1 (b) 0 (c) 1 (d) none of these

Qs.2. a) If $z(x+y)=x^2+y^2$, Show that $\left(\frac{\partial z}{\partial x} - \frac{\partial z}{\partial y}\right)^2 = 4\left(1 - \frac{\partial z}{\partial x} - \frac{\partial z}{\partial y}\right)$

(b) If $u = \frac{y}{z} + \frac{z}{x}$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$.

Qs.3. IF $u = \tan^{-1} \frac{x^3+y^3}{x+y}$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$.

And $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = 2 \cos 3u \sin u$.

Qs.4. If $u = f(r)$ where $r = \sqrt{(x^2 + y^2 + z^2)}$,

show that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = f''(r) + \frac{2}{r} f'(r)$.

Qs.5. (a) If $\phi(cx - az, cy - bz) = 0$ show that $a \frac{\partial z}{\partial x} + b \frac{\partial z}{\partial y} = c$

(b) Find the maximum and minimum value of $x^3 + y^3 - 3axy$

Qs.6. (a) Prove that $(y^2 - z^2 + 3yz - 2x)\hat{i} + 3xz + 2xy\hat{j} + (3xy - 2xz + 2z)\hat{k}$ is both solenoidal and irrotational.

(b) Find $\text{div } F$ and $\text{curl } F$, where $F = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$

Qs.7. (a) If $x = u(1 - v)$, $y = uv$, prove that $JJ' = 1$

(b) If the three thermodynamics variables P, V, T are connected by a relation $f(P, V, T) = 0$, show that $\left(\frac{\partial P}{\partial T}\right)_V \left(\frac{\partial T}{\partial V}\right)_P \left(\frac{\partial V}{\partial P}\right)_T = -1$.



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SE-I [Provisional]

Semester: 1st

Subject: Engineering Mechanics

Answer any five questions [Question No.1 is compulsory].

Each question is of equal weightage [4 Marks]

Session- 2023-24

Course: B.Tech

Question SET- A

Branch: ME+CS+EEE+ECE+CE+CSE

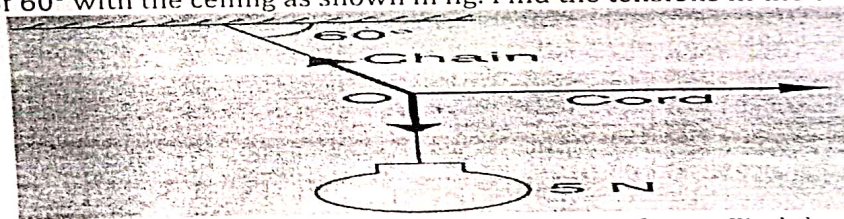
Code: ESEM1

Duration: 90 Minutes

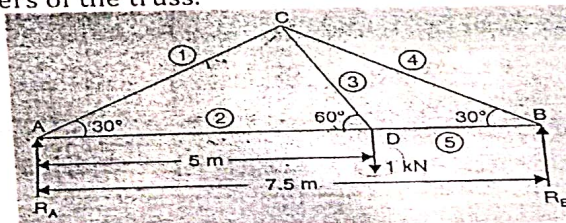
F.M: 20 Marks

1. Multiple Choice Questions

- I. Two forces P and Q are acting at an angle. The resultant force R acts at an angle α with force P, then the value of $\tan^{-1} \frac{Q \sin \alpha}{P + Q \cos \alpha}$ will be
(a) $\tan^{-1} \frac{Q \cos \alpha}{P + Q \cos \alpha}$ (b) $\tan^{-1} \frac{Q \sin \alpha}{P + Q \cos \alpha}$ (c) $\tan^{-1} \frac{Q \cos \alpha}{P + Q \sin \alpha}$ (d) $\tan^{-1} \frac{Q \cos \alpha}{P + Q \cos \alpha}$
- II. A body subjected to coplanar non-concurrent forces will remain in a state of equilibrium if
(a) $\sum F_x = 0$ (b) $\sum F_y = 0$ (c) $\sum M = 0$ (d) All of the above three
- III. The angle of inclination of the plane at which the body begins to move down the plane, is called-
(a) Angle of friction
(b) Angle of repose
(c) Angle of projection
(d) None of these
- IV. When trying to turn a key into a lock, the following is applied:
(a) Coplanar force (b) Lever (c) Moment (d) Couple
- Q2. Three forces of Magnitude 40KN and 20KN are acting at a point O as shown in fig. The angles made by 40KN, 15KN and 20KN Forces with X-axis are 60° , 120° and 240° respectively. Determine the magnitude and direction of the resultant force.
- Q3. A beam of span 10m is carrying a point load of 200N at a distance 4m from A. Determine the beam reactions.
- Q4. State and explain the following laws of forces
i. Law of parallelogram of forces
ii. Law of triangle of forces
iii. Law of polygon of forces
- Q5. A lamp weighing 5N is suspended from the ceiling by a chain. It is pulled aside by a horizontal cord until the chain makes an angle of 60° with the ceiling as shown in fig. Find the tensions in the chain and the cord



- Q6. A truss span of 7.5 m carries a point load of 1kN at joint D as shown in figure. Find the reactions and the forces in the members of the truss.



3031
250

- Q7. Explain the following terms: Friction, limiting force of friction, Angle of Friction and Co-efficient of Friction.

6.25
2.5/2 2.5
2.5/2 2.5

2.5
2.5
12.5



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MSE-I [Provisional]

Session-2023-24

Question SET-A

Semester:I

Course:B. Tech

Branch: CSE+CS+ECE+EEE

Subject: Programming for Problem Solving

Code:ESPP1

Answer any five questions [Question No. 1 is compulsory].

Duration : 90

Minutes

Each question is of equal weightage [4 Marks].

F.M : 20

Marks

Qs.1- MCQ Type [Choose correct answer]

- (i) The brain of the computer is the
(a) Control unit (b) ALU (c) CPU (d) All of these
- (ii) What will be the output of this program?
main()
{printf("javatpoint");
main();}
(a) Wrong statement (b) It will keep on printing javatpoint
(c) It will Print javatpoint once (d) None of the these
- (iii) Which of the following comment is correct when a macro definition includes arguments?
a) The opening parenthesis should immediately follow the macro name.
b) There should be at least one blank between the macro name and the opening parenthesis.
c) There should be only one blank between the macro name and the opening parenthesis.
d) All the above comments are correct.
- (iv) The symbol that is represented using a rectangle in a flowchart is :
(a) Terminal (b) Decision (c) Activity (d) Input/output

Qs.2 What is Computer. Explain the various types of computers

Qs.3 Draw the flowchart and Develop a C program to compute simple interest

Qs.4 What is an operator? List and explain various types of operators

Qs.5 Write a c-program using function to check whether the given number is prime or not.

Qs.6 Write a program to find out area of triangle.

Qs.7 List the differences between while loop and do-while loop. Develop a C program to find sum of Natural numbers from 1 to N using for loop



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MSE-I [Provisional]

Semester: 1st

Session-2023-24

Course: B.Tech

Question SET-A

Branch: CSE+ECE+EEE+CS

Subject: Indian Knowledge System

Code: HSM01

Answer any five questions [Question No. 1 is compulsory].
Each question is of equal weightage [4 Marks].

Duration : 90 Minutes

F.M : 20 Marks

Qs.1 MCQ Type [Choose correct answer]

(i) Indian Knowledge System holds solutions to many of the world's challenges is stated by

- a) Aaryabhata
- b) Dharmendra Pradhan
- c) Swami Vivekananda
- d) Charak

(ii) Great scientists behind the invention of law of motion in ancient India

- a) Newton
- b) Rishi Kanada
- c) Rishi Bhargava
- d) Rishi Kashyapa

(iii) Who is the writer of Yoga Sutra?

- a) Panini
- b) Lord Shiva
- c) Patanjali
- d) Yagyavalkya

(iv) 'Extension of prana' is called -

- a) Pratyahara
- b) Asana
- c) Yama
- d) Pranayama

Qs.2 What is the contribution of Rishi Kanada in ancient India mathematics?

Qs.3 Compare between the laws of motion of Sir Isaac Newton and the Sutra of Rishi Kanada

Qs.4 A simple pendulum takes 32 s to complete 20 oscillations. What is the time period of the pendulum?

Qs.5 Define Karma Yoga. Write the different types of Karma.

Qs.6 How is Ayurveda useful in today's life?

Qs.7 Explain Patanjali's Astanga Yoga and how will it be useful in student's life?



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MSE- I [Provisional]

Semester: 1st

Subject: Engineering Physics

Answer any five questions [Question No. 1 is compulsory]

Each question is of equal weightage [4 Marks]

Session-2023-24

Course: B.Tech.

Question SET- A

Branch: All

Code: ISE01

Duration : 90 Minutes

F.M : 20 Marks

Qs.1. MCQ Type [Choose correct answer]

- i. The function representing matter waves must be
(a) Complex (b) Real (c) Zero (d) Infinity
- ii. What is the ratio of the de Broglie wavelengths of proton and an ' α ' particle if they are accelerated by the same potential difference?
(a) $2\sqrt{2}:1$ (b) $3:2$ (c) $3\sqrt{2}:1$ (d) $2:1$
- iii. Which among the following elements has a body-centered cubic structure?
(a) Uranium (b) Silver (c) Gold (d) Tungsten
- iv. What is the lattice constant for FCC crystal having atomic radius 1.476 \AA
(a) 1.476 \AA (b) 4.1748 \AA
(c) 5.216 \AA (d) 0

Qs.2. Obtain Schrödinger's time dependent wave equation and separate it into space and time dependent parts. Give the probability interpretation of the wave function.

Qs.3. What do you mean by expectation value of a dynamical variable? Obtain expectation value of momentum operator.

Qs.4. Normalize the wave function $\psi = Ae^{-ax^2/2} e^{iEt/\hbar}$ for $x = -\infty$ to for $x = \infty$ and find the expectation values of x and x^2 . Given that $\int_{-\infty}^{\infty} e^{-ax^2} dx = \sqrt{\frac{\pi}{a}}$, $\int_{-\infty}^{\infty} xe^{-ax^2} dx = 0$ and

$$\int_{-\infty}^{\infty} x^2 e^{-ax^2} dx = \frac{1}{2} \sqrt{\frac{\pi}{a^3}}.$$

Qs.5. (a) What is meant by unit cell? What are the lattice parameters for a unit cell?

(b) What is primitive cell and how many atoms are there in a primitive unit cell?

Qs.6. Explain Sommerfeld's free electron theory.

Qs.7. The Fermi temperature of potassium is 24600 K . Calculate the Fermi velocity of electrons in potassium.