

Code No: 133BG

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

METALLURGY AND MATERIALS SCIENCE

(Common to ME, MCT, MSNT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) Differentiate between metal and alloy. [2]
- b) Lattice parameter of a FCC crystal is 3.61 \AA . Calculate atomic density in (111), (110) and (100) planes. [3]
- c) Define Gibb's phase Rule. [2]
- d) List the different methods to construct the phase diagrams. [3]
- e) Define hardenability and what factors it effects. [2]
- f) Which alloy of Fe-Fe₃C system has the lowest melting point? [3]
- g) What is carbon equivalent? [2]
- h) Distinguish between macrostructure and micro structure. [3]
- i) Distinguish between glasses and cermets. [2]
- j) Write the applications of polymers. [3]

PART- B

(50 Marks)

- 2.a) State Hume-Rothery's rules for the formation of substitutional solid solution.
- b) Define solid solution and explain about substitutional solid solutions with suitable examples. [5+5]

OR

- 3.a) Calculate the packing factor for HCP.
- b) Explain about density calculations of crystal structures. [5+5]

4. Draw neatly and explain the phase diagram where two components are completely soluble in liquid state and partly insoluble in solid state (with example). [10]

OR

- 5.a) What is Lever rule? Apply it to phase equilibrium in an alloy of 15% B and 85% A when a liquid of 45% B is in equilibrium with a solid solution of 95% A.
- b) What is Isomorphous alloy system? Explain with suitable example. [5+5]

6. Construct the TTT diagrams for 0.8wt% carbon steels. [10]

OR

- 7.a) What is heat treatment and explain its effect?
- b) Distinguish between annealing and normalizing. [5+5]

26 8.

Write the composition, properties and applications of the following:

a) Duralumin

b) Cartridge brass.

[5+5]

OR

9.a)

Differentiate between white Iron and grey cast Iron.

b)

Explain why extensive coring occurs in bronzes compared to brasses.

[5+5]

26 10.

Enumerate the characteristics, properties and applications of crystalline ceramics.

[10]

OR

11.

Write short notes on:

a) cermets.

b) polymers.

[5+5]

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Code No: 123BR

R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

BASIC ELECTRICAL ENGINEERING

(Common to CSE, IT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

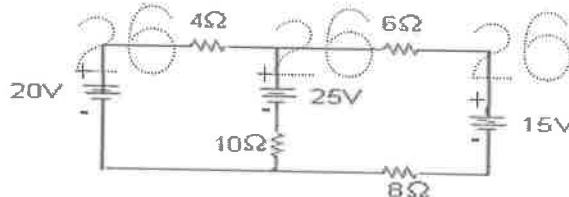
(25 Marks)

- 1.a) State and explain Ohms law. [2]
- b) State and explain Kirchhoff's laws. [3]
- c) What is meant by impedance? [2]
- d) Obtain the form factor of a sinusoidal voltage, $y = V_m \sin \omega t$. [3]
- e) Define efficiency of a Transformer. [2]
- f) What are the characteristics of an Ideal transformer? [3]
- g) Give the applications of 3- ϕ Induction motor. [2]
- h) Based on the type of excitation, classify the DC generators. [3]
- i) Compare spring control and gravity control methods. [2]
- j) What are the advantages and disadvantages of PMMC instrument? [3]

PART-B

(50 Marks)

2. By applying Kirchhoff's laws, find the current through all the elements in the circuit as shown in the figure. [10]



OR

- 3.a) Write short notes on star-delta transformation. If R_{ab} , R_{bc} and R_{ca} are connected in delta, derive the expressions for equivalent star connection. [4+6]
- b) State Thevenin's theorem.

4. An a.c. circuit consists of a resistance of 5 ohms, an inductance of 0.1 H, and a capacitance of 100 μ F, all in series. Determine for this circuit:

- a) Total Impedance
- b) Reactance
- c) Admittance
- d) Susceptance, and
- e) Conductance.

The supply frequency is 60 Hz.

[10]

OR

5.a) Write down the expression for the instantaneous power, and hence derive the equation for the average power.

b) A series R-L-C circuit consists of 100 ohms resistor and an inductor of 0.318 Henry and a capacitor of unknown value. This circuit is supplied by 230V, 50HZ supply and draws a current of 2.3 amps, and the current is in phase with the supply voltage. Find the value of the capacitance, and the power supplied by the source. [5+5]

6.a) Draw the phasor diagram of Transformer under no load.

b) A single phase transformer with a ratio of 440/110V takes a load current of 5A at 0.2 power factor lagging. If the secondary supplies a current of 120A at power factor of 0.8 lagging, estimate the current taken by the primary. [5+5]

OR

7.a) Derive the emf equation of a single phase Transformer.

b) In 25KVA, 2000/200V, single phase Transformer, the iron and full-load copper losses are 50 W and 400 W respectively. Calculate the efficiency at unity power factor of:

- i) Full load and
- ii) Half full-load.

[5+5]

8.a) Explain how the rotating magnetic field is developed in a 3- phase induction Motor.

b) A 6 pole, 3-phase induction motor runs at 1140 rpm on full load when supplied power from a 60Hz supply. Determine the slip at full load. [6+4]

OR

9.a) Derive an expression for the speed of a DC motor in terms of back emf and flux per pole.

b) A 4-pole lap wound D.C. shunt generator has a useful flux per pole of 0.06wb. The armature winding consists of 240 turns each of 0.0035 ohms resistance. Calculate the terminal voltage when running at 920 rpm, if the armature current is 60A. [5+5]

10. Explain the essential requirements of indicating instruments with necessary diagrams. [10]

OR

11. Explain with neat sketch the construction and working of a MI ammeter. [10]

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Code No: 123AH

R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

MATHEMATICS - III

(Common to EEE, ECE, EIE, ETM)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) Determine the nature of the point $x = 0$ for the equation $(x^2 + 1)y'' + (x^2 - 1)y' + 2y = 0$ [2]
- b) Find the indicial equation of $x^2y'' - 2xy' - (x^2 - 2)y = 0$. [3]
- c) Write the value of $J_1(x)$ [2]
- d) Obtain the value of $P_2(x)$. [3]
- e) Write the Cauchy Riemann equations in polar form. [2]
- f) Show that the function $f(z) = \sin x \cosh y + i \cos x \sinh y$ is continuous and analytic everywhere. [3]
- g) Define essential singularity. [2]
- h) Expand $\log z$ by Taylor's series about $z = 1$. [3]
- i) Find the image of $z = -2 - i$ under the transformation $w = z + 2 - 3i$. [2]
- j) Prove that $w = \frac{1}{z}$ is circle preserving. [3]

PART-B

(50 Marks)

2. Find the series solution of $4xy'' + 2y' + y = 0$. [10]
- OR
3. Solve the equation $3x \frac{d^2y}{dx^2} + (1 - x) \frac{dy}{dx} - y = 0$ in power series. [10]
- 4.a) Prove that $\int_{-1}^1 x P_n(x) P_{n-1}(x) dx = \frac{2n}{4n^2 - 1}$.
- b) Show that $J_0^2 + 2(J_1^2 + J_2^2 + J_3^2 + \dots) = 1$. [5+5]
- OR
5. If m_1, m_2 are roots of $J_n(x) = 0$, then prove that $\int_0^1 x J_n(m_1 x) J_n(m_2 x) dx = 0$. [10]
6. State and prove Cauchy's Integral formula. [10]
- OR
7. Evaluate $\int_c (y - x - 3x^2 i) dz$, where c consists of the line segments from $z = 0$ to $z = i$ and the other from $z = i$ to $z = 1 + i$. [10]

8. Evaluate $\int_{-\infty}^{\infty} \frac{z^2 - z + 2}{z^4 + 10z^2 + 9} dz$. [10]

OR

9. Find Laurent expansion of $\frac{1}{z^2 - 4z + 3}$ for $1 < |z| < 3$. [10]

10. Determine the region of the w - plane into which the first quadrant of z - plane is mapped by the transformation $w = z^2$. [10]

OR

11. Show that every bilinear transformation maps the circles in the z - plane onto the circles in the w - plane. [10]

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Code No: 113AH

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

MATHEMATICS – III

(Common to EEE, ECE, EIE, ETM, AGE)

Time: 3 Hours

Max. Marks: 75

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PART- A

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- c) Write the value of $J_1(x)$ [2]
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- e) Write the Cauchy Riemann equations in polar form. [2]
- f) Show that the function $f(z) = \sin x \cosh y + i \cos x \sinh y$ is continuous and analytic everywhere. [3]
- g) Define essential singularity. [2]
- h) Expand $\log z$ by Taylor's series about $z = 1$. [3]
- i) Find the image of $z = 2 - i$ under the transformation $w = z + 2 - 3i$. [2]
- j) Prove that $w = \frac{1}{z}$ is circle preserving. [3]

PART-B

(50 Marks)

2. Find the series solution of $4xy'' + 2y' + y = 0$. [10]
- OR**
3. Solve the equation $3x \frac{d^2y}{dx^2} + (1 - x) \frac{dy}{dx} - y = 0$ in power series. [10]
- 4.a) Prove that $\int_{-1}^1 x P_n(x) P_{n-1}(x) dx = \frac{2n}{4n^2 - 1}$.
- b) Show that $J_0^2 + 2(J_1^2 + J_2^2 + J_3^2 + \dots) = 1$. [5+5]
- OR**
5. If m_1, m_2 are roots of $J_n(x) = 0$, then prove that $\int_0^1 x J_n(m_1 x) J_n(m_2 x) dx = 0$. [10]
6. State and prove Cauchy's Integral formula. [10]
- OR**
7. Evaluate $\int_c (y - x - 3x^2 i) dz$, where c consists of the line segments from $z = 0$ to $z = i$ and the other from $z = i$ to $z = 1 + i$. [10]

8. Evaluate $\int_{-\infty}^{\infty} \frac{z^2 - z + 2}{z^4 + 10z^2 + 9} dz$. [10]

OR

9. Find Laurent expansion of $\frac{1}{z^2 - 4z + 3}$ for $1 < |z| < 3$. [10]

10. Determine the region of the w - plane into which the first quadrant of z - plane is mapped by the transformation $w = z^2$. [10]

OR

11. Show that every bilinear transformation maps the circles in the z - plane onto the circles in the w - plane. [10]

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R13

Code No: 113AQ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech II Year I Semester Examinations, May/June - 2019****METALLURGY AND MATERIALS SCIENCE****(Common to ME, MCT, AME)****Time: 3 Hours****Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
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PART- A**(25 Marks)**

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- b) Lattice parameter of a FCC crystal is 3.61 \AA . Calculate atomic density in (111), (110) and (100) planes. [3]
- c) Define Gibb's phase Rule. [2]
- d) List the different methods to construct the phase diagrams. [3]
- e) Define hardenability and what factors it effects. [2]
- f) Which alloy of Fe-Fe₃C system has the lowest melting point? [3]
- g) What is carbon equivalent? [2]
- h) Distinguish between macrostructure and micro structure. [3]
- i) Distinguish between glasses and cermets. [2]
- j) Write the applications of polymers. [3]

PART- B**(50 Marks)**

- 2.a) State Hume-Rothery's rules for the formation of substitutional solid solution. [5]
- b) Define solid solution and explain about substitutional solid solutions with suitable examples. [5]

OR

- 3.a) Calculate the packing factor for HCP. [5]
- b) Explain about density calculations of crystal structures. [5]

4. Draw neatly and explain the phase diagram where two components are completely soluble in liquid state and partly insoluble in solid state (with example). [10]

OR

- 5.a) What is Lever rule? Apply it to phase equilibrium in an alloy of 15% B and 85% A when a liquid of 45% B is in equilibrium with a solid solution of 95% A. [5]
- b) What is Isomorphous alloy system? Explain with suitable example. [5]

6. Construct the TTT diagrams for 0.8wt% carbon steels. [10]

OR

- 7.a) What is heat treatment and explain its effect? [5]
- b) Distinguish between annealing and normalizing. [5]

26 8. Write the composition, properties and applications of the following: 26 26
a) Duralumin
b) Cartridge brass. [5+5]

OR

- 9.a) Differentiate between white Iron and grey cast Iron.
b) Explain why extensive coring occurs in bronzes compared to brasses. [5+5]

26 10. Enumerate the characteristics, properties and applications of crystalline ceramics. 26
[10]

OR

11. Write short notes on:
a) cermets.
b) polymers. [5+5]

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Code No: 123AQ

R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

METALLURGY AND MATERIALS SCIENCE

(Common to ME, MCT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
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PART- A

(25 Marks)

- 1.a) Differentiate between metal and alloy. [2]
- b) Lattice parameter of a FCC crystal is 3.61 \AA . Calculate atomic density in (111), (110) and (100) planes. [3]
- c) Define Gibb's phase Rule. [2]
- d) List the different methods to construct the phase diagrams. [3]
- e) Define hardenability and what factors it effects. [2]
- f) Which alloy of Fe-Fe₃C system has the lowest melting point? [3]
- g) What is carbon equivalent? [2]
- h) Distinguish between macrostructure and micro structure. [3]
- i) Distinguish between glasses and cermets. [2]
- j) Write the applications of polymers. [3]

PART- B

(50 Marks)

- 2.a) State Hume-Rothery's rules for the formation of substitutional solid solution.
- b) Define solid solution and explain about substitutional solid solutions with suitable examples. [5+5]

OR

- 3.a) Calculate the packing factor for HCP.
- b) Explain about density calculations of crystal structures. [5+5]

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OR

- 5.a) What is Lever rule? Apply it to phase equilibrium in an alloy of 15% B and 85% A when a liquid of 45% B is in equilibrium with a solid solution of 95% A.
- b) What is Isomorphous alloy system? Explain with suitable example. [5+5]

6. Construct the TTT diagrams for 0.8wt% carbon steels. [10]

OR

- 7.a) What is heat treatment and explain its effect?
- b) Distinguish between annealing and normalizing. [5+5]

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Code No: 53007

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

MATHEMATICS-III

(Common to EEE, ECE, EIE)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Prove that $\beta\left(m, \frac{1}{2}\right) = 2^{2m-1} \beta(m, m)$
- b) Show that $J_n(x) = \frac{1}{\pi} \int_0^\pi \cos(n\theta - x \sin\theta) d\theta$. [7+8]
- 2.a) Show that $(1 - 2xt + t^2)^{-\frac{1}{2}} = P_0(x) + P_1(x)t + P_2(x)t^2 + \dots$
- b) Prove that $P'_n - P'_{n-2} = (2n-1)P_{n-1}$. [8+7]
- 3.a) If $\tan \log(x + iy) = a + ib$, where $a^2 + b^2 \neq 1$. Show that $\tan \log(x^2 + y^2) = \frac{2a}{i - a^2 - b^2}$.
- b) If $u = e^x [(x^2 - y^2) \cos y - 2xy \sin y]$ is a real part of an analytic function. Find the analytic function. [7+8]
- 4.a) Evaluate $\int_{(0,0)}^{(1,1)} [3x^2 + 5y + i(x^2 - y^2)] dz$ along with $y^2 = x$.
- b) Evaluate $\int_c \frac{e^{2z}}{(z+1)^4} dz$ around $c: |z - 1| = 3$. [8+7]
- 5.a) Find the Laurent series of $\frac{z^2 - 1}{(z+2)(z+3)}$ for $|z| > 3$.
- b) Find the order of all zeros for the function $e^{\tan z}$. [8+7]
6. Show that using residue theorem, $\int_0^{2\pi} \frac{1}{a + b \sin \theta} d\theta = \frac{2\pi}{\sqrt{a^2 - b^2}}$, $a > b > 0$. [15]
- 7.a) Under the transformation $w = \frac{1}{z}$. Find the image of the circle $|z - 2i| = 2$.
- b) Find the bilinear transformation which maps the points $(-1, 0, 1)$ into the points $(0, i, 3i)$. [7+8]
- 8.a) Define the following:
 - i) A circuit
 - ii) Connected graph
 - iii) Hamiltonian path.
- b) Prove that number of edges in a bipartite graph with n vertices is at most $(n^2/4)$. [8+7]

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R09

Code No: 53018

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, May/June - 2019

METALLURGY AND MATERIAL SCIENCE

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 75

**Answer any five questions
All questions carry equal marks**

1. Discuss the effect of grain boundaries on the properties of metal/alloys. [15]
- 2.a) What is the necessity of alloying?
b) What is solid solution? Explain different types of solid solutions with neat sketches and examples. [7+8]
- 3.a) Draw Cu-Ni phase diagram. Label all points, lines and areas. Explain the cooling behavior of 60Ni-40Cu alloy from liquid state to room temperature.
b) Differentiate between congruent melting compound and interstitial solid solution. [8+7]
4. What are Hadfield manganese steels? Discuss them with respect to classification, heat treatment and properties. [15]
- 5.a) What are the limitations on the use of the I-T diagram?
b) Define critical cooling rate. What factors influence the critical cooling rate? Explain. [7+8]
- 6.a) Discuss the effect on corrosion resistance of copper by increasing the additions of
i) Zinc ii) Tin iii) Nickel.
b) Why is muntz metal heat treatable? Describe a typical heat treatment cycle and the resulting microstructure. [7+8]
- 7.a) Explain why crystalline ceramic materials are normally brittle.
b) Explain the classification of ceramic materials on the basis of application. Give at least two examples for each. [7+8]
8. Distinguish the three different types of fiber reinforced composites on the basis of fiber length and orientation comment on the distinctive mechanical characteristics of each type. [15]

---ooOoo---