

Entrance Examinations 2026

Ph.D. (Materials Engineering)

Marks: 70

Time: 2 h

Hall Ticket No:

- I.** Write your Hall Ticket Number on the OMR Answer Sheet given to you. Also write the Hall Ticket Number in the Space provided above.
 - II.** Read the following instructions carefully before answering the questions.
 - III.** This Question paper has TWO parts: PART 'A' and PART 'B'
1. Part 'A': It consists of 20 objective type questions of **1.75** marks each.
 2. Part 'B': It consists of 35 objective questions of **1** mark each.
 3. All questions are to be answered. Answers for these questions are to be entered on the OMR sheet, filling the appropriate circle against each question. For example, if the answer to a question is D, it should be marked as below:



No additional sheets will be provided. Rough work can be done in the question paper itself.

4. Hand over the OMR answer sheet at the end of the examination to the invigilator.
5. Only non-programmable (only scientific) calculators are permitted inside the Examination Hall.
6. This book contains 11 pages including this cover sheet.

F-25

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PART A

1. A committee of 4 members is to be formed from a group of 5 scientists and 3 economists. If every selection is equally likely, then the probability that at least one economist is included in the committee is _____ (round off to 2 decimal places).
A. 0.82
B. 0.87
C. 0.93
D. 0.96
2. Which of the following statements is true about the eigenvalues of a real symmetric matrix?
A. They are always imaginary
B. They are always real
C. They are always positive
D. They are always distinct
3. Arjun's score in an exam is 72. Bharat's score is 58, and Chetan's score is 65. Dev scored higher than Chetan but lower than Arjun. Elan scored lower than Bharat. From the information given, what is one possible score for Dev?
A. 57
B. 64
C. 69
D. 73
4. A car at rest has a mass of 1000 kg. It is moved by a horizontal force of 50 N on a horizontal surface. The work done by the force in 8 s is
A. 50 J
B. 60 J
C. 70 J
D. 80 J
5. The height from the surface of the earth at which the value of "g" will be reduced by 64% of the value at the earth surface is (Radius of earth, $R = 6400$ km)
A. 426.67 km
B. 4266.7 km
C. 42.667 km
D. 4.2667 km
6. When a body is weighed in a liquid the loss in its weight is equal to
A. weight of water displaced by the body
B. weight of liquid displaced by the body
C. the upthrust of liquid on the body
D. the difference in weights of the body in air and liquid

7. A train travels from City A to City B at a speed of 90 km/h and returns along the same route at a speed of 60 km/h. On the return journey, the train halts midway for 30 minutes. If the total travel time including the halt is 3 hours, what is the distance between City A and City B?
- A. 72 km
B. 81 km
C. 90 km
D. 96 km
8. A wire of length 50 cm has a mass of 20 g. If its radius is halved by stretching, its new mass per length will be
- A. 0.2 g cm^{-1}
B. 0.1 g cm^{-1}
C. 0.3 g cm^{-1}
D. 0.4 g cm^{-1}
9. If $z = x + iy$ is a complex number, then which of the following represents the modulus of z ?
- A. $x^2 + y^2$
B. $\sqrt{(x^2 - y^2)}$
C. $\sqrt{(x^2 + y^2)}$
D. $x - iy$
10. A first-order homogeneous differential equation is one that
- A. can be written in the form $\frac{dy}{dx} = f\left(\frac{y}{x}\right)$
B. always has a zero solution
C. has only constant coefficients
D. cannot be solved by substitution
11. When a car's speed is doubled, the distance required to stop it with the same braking force and conditions, becomes ____ times longer
- A. 4
B. 2
C. 3
D. 2.8
12. If $x = k + 1$, $y = 2k - 1$ is a solution of the equation $3x - 2y + 7 = 0$, then $k = ?$
- A. 12
B. 3
C. 4
D. 6

13. The eigen values of a matrix $A = \begin{pmatrix} a & -b \\ b & a \end{pmatrix}$ are
- A. $a \pm ib$
 - B. $a^2 \pm ib^2$
 - C. $a^3 \pm ib^3$
 - D. $\sqrt{a + ib}$
14. Which one of the following is true regarding the argument (arg) of two complex numbers z_1 and z_2
- A. $\arg(z_1 z_2) = \arg(z_1) + \arg(z_2)$
 - B. $\arg(z_1 z_2) = \arg(z_1) \arg(z_2)$
 - C. $\arg(z_1 z_2) = \sqrt{\arg(z_1) + \arg(z_2)}$
 - D. $\arg(z_1 z_2) = \sqrt{\arg(z_1) \arg(z_2)}$
15. In a tournament with 10 teams, if each team plays against every other team twice, then the total number of matches is
- A. 100
 - B. 90
 - C. 81
 - D. 45
16. What percentage of numbers from 1 to 70 have 1 or 9 in the unit's place?
- A. 1
 - B. 14
 - C. 20
 - D. 21
17. A person walks 10 meters in front and 10 meters to the right. Then every time turning to his left, he walks 5, 15, and 15 meters respectively. How far is he now from his starting point?
- A. 5 m
 - B. 10 m
 - C. 15 m
 - D. 20 m
18. A cube is painted on all sides and cut into 64 smaller equal cubes. How many cubes will have no painted surface?
- A. 8
 - B. 16
 - C. 24
 - D. 27

19. A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs. 3200. With the help of C, they completed the work in 3 days. How much is to be paid to C?
- A. Rs. 375
 - B. Rs. 400
 - C. Rs. 600
 - D. Rs. 800
20. Which of the following is a compound semiconductor?
- A. Si
 - B. Ge
 - C. Both Si and Ge
 - D. CdS

Part B

21. The focal length of a lens is properly defined as
- A. the distance from the object to the lens
 - B. the distance from the lens to the image it forms
 - C. the distance from the optical centre of the lens to its focus
 - D. the size of the lens aperture
22. Which of the following microalloying elements is commonly added to HSLA steels to promote grain refinement?
- A. Sn
 - B. Nb
 - C. Pb
 - D. Zn
23. In hypoeutectoid steels, which of the following proeutectoid phase is formed prior to the eutectoid transformation?
- A. Cementite
 - B. Martensite
 - C. Ferrite
 - D. Bainite
24. The total magnetic moment of an isolated Mn^{+2} cation, assuming that the orbital angular momentum is quenched ($L = 0$), is
- A. $5.9 \mu_B$
 - B. $2.5 \mu_B$
 - C. $4.9 \mu_B$
 - D. $3.5 \mu_B$

25. For Debye solids, low temperature (T) heat capacity has
- A. Exponential T dependence
 - B. Linear T dependence
 - C. Cubic T dependence
 - D. Square T dependence
26. Which of the following statements is correct?
- A. All pyroelectrics are ferroelectrics but not all ferroelectrics are pyroelectrics
 - B. All ferroelectrics are pyroelectrics but not all pyroelectrics are ferroelectrics
 - C. All ferroelectrics are not pyroelectrics
 - D. Some ferroelectrics are not pyroelectrics
27. Out of the two energy storage devices, dielectric capacitors and fuel cells, which of the following statements is correct?
- A. Dielectric capacitors have high power density but low specific energy density
 - B. Dielectric capacitors have low power density but high specific energy density
 - C. Fuel cells have high power density but low specific energy density
 - D. Fuel cells have low power density and low specific energy density
28. Which of the following materials is preferred in making the powder compacting dies for production of components in powder metallurgy industry?
- A. Mild steel
 - B. Cemented carbide
 - C. Brass
 - D. Al
29. Froth flotation, one of the most outstanding mineral beneficiation techniques, mostly relies on
- A. surface properties of the mineral particles
 - B. microstructure of the mineral particles
 - C. porosity of mineral particles
 - D. melting temperature of mineral particles
30. Which of the following metals is extracted from wolframite ore?
- A. nickel
 - B. cobalt
 - C. tungsten
 - D. niobium
31. Tempering treatment on steels is carried out to increase its
- A. tensile strength
 - B. toughness
 - C. hardness
 - D. creep resistance

32. Hall-Heroult process is employed for extraction of
- A. aluminium
 - B. platinum
 - C. silver
 - D. gold
33. NiFe_2O_4 is known to have inverse spinel structure, whereas ZnFe_2O_4 normal spinel structure. If 10% NiFe_2O_4 is substituted with ZnFe_2O_4 then the net magnetic moment of the mixed Ni-Zn ferrite ($0.9\text{NiFe}_2\text{O}_4-0.1\text{ZnFe}_2\text{O}_4$) is,
- A. $1.8 \mu_B/\text{molecule}$
 - B. $2.8 \mu_B/\text{molecule}$
 - C. $7.3 \mu_B/\text{molecule}$
 - D. $5.8 \mu_B/\text{molecule}$
34. What does the “nose” of a TTT (Time–Temperature–Transformation) diagram represent?
- A. Minimum transformation time
 - B. Maximum grain size
 - C. Martensite finish temperature
 - D. Liquidus temperature
35. Which of the following unit cells has the least symmetry?
- A. Cubic
 - B. Tetragonal
 - C. Hexagonal
 - D. Triclinic
36. In stainless steels, which of the following are the major alloying elements
- A. Zn and Hg
 - B. Sn and Sb
 - C. Ni and Cr
 - D. Cr and Hg
37. The amount of silver in German silver is
- A. 0 %
 - B. 5 %
 - C. 25.5 %
 - D. 100 %
38. Widmanstatten structure is usually found in
- A. Ti-alloys
 - B. Cu-alloys
 - C. Au-alloys
 - D. Zn-alloys

39. Which of the following equations represents the eutectoid reaction in steels?
- A. Liquid $\leftrightarrow$ Austenite + Cementite
 - B. Austenite $\leftrightarrow$ Ferrite + Cementite
 - C. Ferrite + Cementite $\leftrightarrow$ Austenite
 - D. Liquid + Ferrite $\leftrightarrow$ Austenite
40. The elastic modulus of a material during a uniaxial tensile test in the elastic regime
- A. depends on the tensile stress and shear stress
 - B. does not depend on the shear stress but depends on the tensile stress
 - C. depends on tensile stress and tensile strain
 - D. does not depend on the tensile stress or tensile strain
41. Which one of the following statements is true for a class 3 lever?
- A. The fulcrum is in between load and effort
 - B. The load is in between fulcrum and effort
 - C. The effort is in between load and fulcrum
 - D. The effort and load can be on either side of the fulcrum
42. Which of the following metals cannot be electroplated from an aqueous electrolyte?
- A. Al
 - B. Cu
 - C. Zn
 - D. Au
43. Based on the standard galvanic series, select the correct sequence of metals in the increasing order of anodic behaviour
- A. Zn, Fe, Pt and Cu
 - B. Pt, Zn, Cu and Fe
 - C. Fe, Pt, Cu and Zn
 - D. Pt, Cu, Fe and Zn
44. Which of the following form of corrosion is difficult to monitor?
- A. Pitting
 - B. Galvanic
 - C. Crevice
 - D. Stress
45. Which of the following inter metallic is present as γ'' phase in Inconel 718?
- A. Ni_3Nb
 - B. Ni_3Al
 - C. Cr_{23}C_6
 - D. Fe_3C

46. Which of the following FCC planes will have the highest surface energy?
- A. {100}
 - B. {110}
 - C. {111}
 - D. {112}
47. The third law of thermodynamics enables measurement of absolute values of
- A. internal energy
 - B. entropy
 - C. Gibbs energy
 - D. Enthalpy
48. Slip casting process is best suited for shaping of
- A. refractory metals
 - B. titanium alloys
 - C. ceramic materials
 - D. nickel base superalloys
49. Which of the following material has anisotropic thermal conductivity?
- A. Glass
 - B. Copper
 - C. Graphite
 - D. Water
50. Which of the following processes is widely used for manufacturing turbine blades with complex geometries?
- A. Powder rolling
 - B. Sand casting
 - C. Investment casting
 - D. Forging only
51. Fatigue strength in metals can be increased by
- A. increase in grain size
 - B. decrease in grain size
 - C. increase in tensile residual stress
 - D. increase in surface roughness
52. Creep strength of metals can be decreased by
- A. decrease in grain size
 - B. increase in grain size
 - C. dispersion hardening
 - D. high thermal stability

53. The matrix phase present in most of the Ni-based super alloys is
- A. BCC α phase
 - B. FCC γ phase
 - C. HCP ϵ phase
 - D. Orthorhombic phase
54. Which of the following properties is most critical for materials used in turbine blades?
- A. High thermal expansion
 - B. Low melting point
 - C. Excellent creep resistance
 - D. High electrical resistivity
55. Which of the following phases is generally considered undesirable in alloys due to its detrimental effect on ductility?
- A. γ phase
 - B. γ' phase
 - C. Topologically close pack phases
 - D. Carbide phase

University of Hyderabad
Entrance Examinations - 2026
Ph.D. Admissions

Revised key

School: School of Engineering Sciences and Technology

Course : Ph.D.

Subject

: Materials Engineering (F25)

Q.No.	Answer	Q.No.	Answer	Q.No.	Answer
1	C ✓	26	B ✓	51	B ✓
2	B ✓	27	A ✓	52	A ✓
3	C ✓	28	B ✓	53	B ✓
4	D ✓	29	A ✓	54	C ✓
5	B ✓	30	C ✓	55	C ✓
* 6	C ✓	31	B ✓		
7	C ✓	32	A ✓		
8	B ✓	33	B ✓		
9	C ✓	34	A ✓		
10	A ✓	35	D ✓		
11	A ✓	36	C ✓		
12	A ✓	37	A ✓		
13	A ✓	38	A ✓		
14	A ✓	39	B ✓		
15	B ✓	40	D ✓		
16	C ✓	41	C ✓		
17	A ✓	42	A ✓		
18	A ✓	43	D ✓		
19	B ✓	44	A ✓		
20	D ✓	45	A ✓		
21	C ✓	46	B ✓		
22	B ✓	47	B ✓		
23	C ✓	48	C ✓		
24	A ✓	49	C ✓		
25	C ✓	50	C ✓		

Note/Remarks :

* Please award marks to all candidates who attempted question No. 6

Smiker
16/06/2026

Signature 
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