5000+
Objective Solved Questions

Volume-1

Strength of Materials
Fluid Mechanics

MCQ

MECHANICAL ENGINEERING

Topic Wise Objective Question & Answer with Solution

Topic Wise Presentation | Throughly Revised & Updated

Also Useful for

State Engineering Service Examinations,
Public Sector Examination
&
Other Competitive Examinations.

EA-Publications
ENGINEERS ACADEMY PUBLICATIONS

Log on to : www.eapublications.org | Ph. : 08094441777

Publisher and Distributor

Engineers Academy Publications

100-102, Ram Nagar, Bambala Puliya, Toll Tax,
Tonk Road, Pratap Nagar, Jaipur (Rajasthan)-302033
E-Mail : engineers.academy.india@gmail.com

ISBN : 978-93-93531-40-7

First Edition : 2025

Price : ₹ 600.00

DIRECTOR'S *Message*

To reach heights one must start climbing and if the journey is difficult then perseverance is the key to success. As a teacher we have realized over past years that success in any competitive exam requires hard work and proper guidance. **Engineers Academy** with its unique teaching methodologies has always proved that we meet the expectations of thousands of students and parents to make their dreams come true. With changing patterns, we have adapted ourselves to deliver the best and ensure better results.

This book has been organized and executed with a lot of care, dedication and passion for lucidity. A conscious attempt has been made to simplify the concepts to facilitate better understanding of the subject.

Engineers Academy has many successful stories of students who secured All India Rank in ESE, GATE, PSUs and JEn. Now we invite you to become a part of Engineers Academy to explore and achieve ultimate goal of your life. We promise to provide you quality guidance with competitive environment which is far advanced and ahead than the reach of other institution.

We would feel satisfied if the book meets the needs of the students for whom it is meant.

Lastly, we are thankful to all the engineers, authors whose work has been the source of enlightenment, inspiration and guidance in presenting this book.

It is hoped that the book in its new form will enjoy its ever increasing popularity.

Regards

Dr. Pankaj Goyal

Preface

This book has been written to meet the growing requirements of candidates appearing for BSNL, DRDO, ISRO, BARC, ECIL, TTA, RRB-JE, State and Public Sector Engineering Examinations. Though every candidate has ability to succeed but competitive environment, in-depth knowledge, quality guidance, time management and good source of study is required to achieve goals.

This book includes Multiple Choice Questions (MCQ) which works as a mock exam practice for the reader. Questions of all the subject have been organized in systematic, concepts oriented and error less manner so that it become easy and interesting for even a beginner to understand. It is a very convenient book and must be solved by candidate aiming for competitive exams.

After solving this booklet students can feel encouraged and develop confidence to attempt each and every type of numerical as well as theoretical problems. Each problems explains solving approach so that at the end, so the reader is well equipped to be able to apply any type of problem solving requirement and distinctly choose one strategy or type from the other.

We hope this book will be proved an important tool to succeed in BSNL, DRDO, ISRO, BARC, ECIL, TTA, RRB-JE, State and Public Sector Engineering Examinations.

It is earnestly hoped that with the extensive additions and revisions, the present edition will facilitate the students not only in preparing themselves for competitive examinations but also in preparing for their regular examinations and prove more useful to the students than the earlier editions.

Even though, enough readings were given for correcting the error and printing mistakes, due to human tendency there could be some minor types in the book. If any such types found, they will be highly appreciated and in corporated in the next edition. Also, please provide your valuable suggestions at : engineers.academy.india@gmail.com

Wish you all the best. Have a nice reading.

Team of
Engineers Academy Publications

CONTENTS

UNIT-I

STRENGTH OF MATERIALS

ENGINEERS ACADEMY®
Your GATEway to Professional Excellence
IES • GATE • PSUs • JTO • IAS • NET

www. eapublications.org

CHAPTER 1

INTRODUCTION

OBJECTIVE QUESTIONS

1. Actual rupture stress is

(a) Breaking stress

(b) Maximum load/original cross-sectional area

(c) Load at breaking point/true strain

(d) Load at breaking point/neck area

2. Elasticity of various materials is controlled by its

(a) Ultimate tensile stress

(b) Proof stress

(c) Stress at yield point

(d) Stress at elastic limit

3. Ratio of lateral strain to linear strain within elastic limit, is known as

(a) Young's modulus

(b) Bulk modulus

(c) Modulus of rigidity

(d) Poisson's ratio

4. Ratio of direct stress to volumetric strain in case of a body subjected to three mutually perpendicular stress of equal intensity, is

(a) Young's modulus

(b) Bulk modulus

(c) Modulus of rigidity

(d) None of the above

5. If a material expands freely due to heating it will develop

(a) Thermal stresses (b) Tensile stress

(c) No stress (d) Bending

6. In a tensile test, near the elastic limit zone,

(a) Tensile strain increases more quickly

(b) Tensile strain decreases more quickly

(c) Tensile strain increases in proportion to the stress

(d) Tensile strain decreases in proportion to the stress

7. The property of a material by virtue of which it can be beaten or rolled into plates is called

(a) Malleability (b) Ductility

(c) Plasticity (d) Elasticity

8. Change in the unit volume of a material under tension with increase in its Poisson's ratio will

(a) Increase (b) Decrease

(c) Remain same (d) Unpredictable

9. The phenomenon of slow extension of the material, i.e. stress increasing with the time at a constant load is called

(a) Creeping (b) Yielding

(c) Breaking (d) Plasticity

10. For steel, the ultimate strength in shear as compared to in tension is nearly

(a) same (b) half

(c) one-third (d) two-third

11. Tensile strength of a material is obtained by dividing the maximum load during the test by the

(a) Area at the time of fracture

(b) Original cross-sectional area

(c) Average of (a) and (b)

(d) Minimum area after fracture

12. Maximum elastic strain energy that can be stored in a body is known as

(a) Impact energy (b) Resilience

(c) Proof resilience (d) None of the above

13. Proof stress

(a) Is the safest stress

(b) Causes a specified permanent deformation in a material, usually 0.1%-0.2%

(c) Is used in connection with materials like mild steel

(d) Does not exist

14. A material having same properties in all directions at a given point is known as

(a) Orthotropic material

(b) Isotropic material

(c) Elastic material

(d) Homogenous material

15. The Bulk modulus K, the modulus of rigidity N and Poisson's ratio 1/m are related by

(a) $\frac{1}{m}=\frac{9KN}{3K+N}$ (b) $\frac{1}{m}=\frac{3K-2N}{2N+6K}$

(c) $\frac{1}{m}=\frac{6K+2N}{3K-2N}$ (d) None of the above

16. The stress at which extension of the material takes place more quickly as compared to the increase in load is called

(a) Elastic point of the material

(b) Plastic point of the material

(c) Breaking point of the material

(d) Yielding point of the material

17. When it is indicated that member is elastic, it means that when force is applied, it will

(a) Not deform (b) Be safest

(c) Stretch (d) Not stretch

18. A material capable of absorbing large amount of energy before fracture is known as

(a) ductility (b) toughness

(b) resilience (d) shock proof

19. If the thickness and width of each plate of a laminated spring be t and w respectively, then its moment of inertia is equal to

(a) $\frac{wt^3}{12}$ (b) $\frac{t^2w^3}{12}$

(c) $\frac{wt^2}{12}$ (d) $\frac{tw^2}{12}$

20. During a tensile test on a specimen of $1cm^2$ cross-section, maximum load observed was 8 tonnes and area of cross-section at neck was 0.5 cm^2. Ultimate tensile strength of specimen is

(a) 4 tonnes/cm^2 (b) 8 tonnes/cm^2

(c) 16 tonnes/cm^2 (d) 22 tonnes/cm^2

21. A material obey's hooke's law up to

(a)Plastic limit

(b) Elastic limit

(c) Yield point

(d) Limit of proportionality

22. True stress-strain curve for materials is plotted between

(a) Load/original cross-sectional area and change in length/original length

(b) Load/instantaneous cross-sectional area and $\log_e\left(\frac{\text{Original area}}{\text{Instantaneous area}}\right)$

(c) Load/instantaneous cross-sectional area and change in length/original length

(d) Load/instantaneous area and instantaneous area/original area

23. The intensity of stress which causes unit longitudinal is called
(a) Unit stress
(b) Modulus of rigidity
(c) Bulk modulus
(d) Modulus of elasticity

24. Modulus of rigidity is defined as the ratio of
(a) Longitudinal stress and longitudinal strain
(b) Volumetric stress and volumetric strain
(c) Lateral stress and lateral strain
(d) Shear stress and shear strain

25. The ultimate tensile stress of mild steel compared to ultimate compressive stress is
(a) Same (b) More
(c) Less (d) Unpredictable

26. Modular ratio of two materials is the ratio of
(a) Strains
(b) Stress and strain
(c) Shear stress and shear strain
(d) Moduli of elasticity

27. Elasticity of a M.S. specimen is defined by
(a) Hooke's law (b) Yield point
(c) Plastic flow (d) Proof stress

28. If a material is loaded beyond yield point stress
(a) It becomes elastic
(b) It becomes ductile
(c) Its resistance to fatigue increases
(d) It loses its tendency to return to its original shape

29. A cylindrical section having no joint is known as
(a) Jointless section (b) Homogeneous section
(c) Perfect section (d) Seamless section

30. The bulk modulus of a material is defined as the ratio of
(a) Volume change to modulus of elasticity
(b) Stress intensity to volumetric strain
(c) Volume change to original volume
(d) Pressure applied to the change in volume

31. During the tensile test of a glass rod the nature of stress-strain curve is
(a) Straight and dropping
(b) Sudden break
(c) Straight line
(d) Parabolic

32. Modulus of resilience is
(a) Property to resist shocks
(b) The property to store energy without undergoing permanent deformation
(c) An index of elasticity
(d) An index of compressibility

33. Moment of inertia of a square of side d about the diagonal is
(a) $\frac{d^4}{12}$ (d) $\frac{d^4}{24}$
(c) $\frac{d^4}{18}$ (d) $\frac{d^4}{8}$

34. Disruptive strength is the maximum strength of a metal.
(a) When subjected to three principal tensile stresses at right angles to one another and all of equal magnitude.
(b) When loaded in tension
(c) When loaded in compression
(d) When loaded in shear

35. Radius of gyration for a circular section is
(a) Directly proportional to the diameter of the section
(b) Square root of the diameter of the section
(c) Inversely proportional to the diameter of the section
(d) None of the above

36. Strain energy stored in a body of volume V with stress due to gradually applied load is
(a) $\frac{\sigma E}{V}$ (b) $\frac{\sigma E^2}{V}$
(c) $\frac{\sigma V^2}{E}$ (d) $\frac{\sigma^2 V}{2E}$

37. A non-yielding support implies that the

(a) Support is frictionless

(b) Support can take any amount of reaction

(c) Support holds member firmly

(d) Slope of the beam at the support is zero

38. Material which exhibit the same elastic properties in given direction at all point is called

(a) Homogeneous (b) Inelastic

(c) Isotropic (d) Isentropic

39. Most elastic material is

(a) Rubber (b) Plastic

(c) Brass (d) Steel

40. The value of modulus of elasticity for mild steel is of the order of

(a) 2.1×10^8 kg/cm^2

(b) 2.1×10^6 kg/cm^2

(c) 2.1×10^7 kg/cm^2

(d) 0.1×10^6 kg/cm^2

41. Compound beams are those in which

(a) Reaction components are more than three

(b) Reaction components are three

(c) Reaction components are more than three but for each additional reaction components, one hinge is introduced.

(d) None of the above

42. Condition to determine the reactions of each support of beam is

(a) Algebraic sum of all vertical forces is zero

(b) Algebraic sum of all horizontal forces is zero

(c) Algebraic sum of all moments about any point is zero

(d) All of the above

43. Number of independent elastic constant for an isotropic, homogeneous and elastic material obeying hooke's law is

(a) 1 (b) 2

(c) 5 (d) 6

44. The capacity of a material to undergo deformation under tension without rupture is

(a) Mechanical strength

(b) Stiffness

(c) Toughness

(d) Ductility

[NTPC-DIP - Trainee]

45. Slow and progressive deformation of a material with time under constant stress is called

(a) Creep (b) Erosion

(c) Resilience (d) Fatigue

[NTPC-DIP - Trainee]

46. The resistance to fatigue of a material is measured by

(a) Elastic limit

(b) Young's modulus

(c) Ultimate tensile strength

(d) Endurance limit

[NTPC-DIP - Trainee]

47. A body having same properties throughout its volume is said to be

(a) Isotropic (b) Continuous

(c) Homogeneous (d) Uniform

[NTPC-DIP - Trainee]

48. Lateral strain ($\in'$) can be expressed as

(a) $\frac{\delta l}{l}$ (b) $\frac{l}{\delta l}$

(c) $\mu \in$ (d) $-\mu \in$

[CEMPM - 2018]

49. The ratio of modulus of rigidity to modulus of elasticity of a material for a Poisson's ratio of 0.25 would be

(a) 0.5 (b) 0.4

(c) 0.3 (d) 0.1

[NTPC-DIP - Trainee]

50. When mechanical properties of a material remain same in a particular direction at each point, such a material is called

(a) Isotropic (b) Homogeneous

(c) Orthotropic (d) Anisotropic

[NTPC-DIP - Trainee]

51. The centre of gravity of a plane lamina is not at its geometrical centre, if it is a

(a) Circle (b) Square

(c) Rectangle (d) Right-angled triangle

[NTPC-DIP - Trainee]

52. Which of the following properties of mild steel cannot be determined by a static tensile test of the sample?

(a) Ultimate tensile strength

(b) Ultimate shear strength

(c) Ductility

(d) Poisson's ratio

[NTPC-DIP - Trainee]

53. Stress relaxation is the phenomenon

(a) In which stress remains constant on increasing load

(b) Stress reduced on increasing load

(c) In which deformation tends to loosen the joint and produces a reduced stress

(d) In which parts are not loaded

54. The maximum stress a material can stand before it breaks is called the

(a) Working stress

(b) Ultimate stress

(c) Compressive stress

(d) Transverse stress

55. The value of Poisson's ratio for steel is between the range of

(a) 0.4 to 0.6

(b) 0.21 to 0.24

(c) 0.01 to 0.2

(d) 0.25 to 0.33

56. The relation between modulus of elasticity (E) and bulk modulus (k) is

(a) E = 3k(1-2Poisson's ratio)

(b) E=3k(1+Poisson's ratio)

(c) E = 3k (1+2Poisson's ratio)

(d) E = 3k(1-Poisson's ratio)

57. For a linearly elastic, isotropic and homogeneous material, the number of elastic constants required to relate stress and strain is

(a) Two (b) Three

(c) Four (d) Six

[TSPSC - AE]

58. Young's modulus of elasticity and Poisson's ratio of a material are 1.25×10^5 MPa and 0.34 respectively. The modulus of rigidity of the material will be

(a) 0.4025×10^5 MPa

(b) 0.4664×10^5 MPa

(c) 0.8375×10^5 MPa

(d) 0.9469×10^5 MPa

[TSPSC - AE]

59. If a material has a modulus of elasticity of 2×10^6 kg/cm^2 and a modulus of rigidity of 0.8×10^6 kg/cm^2, then the approximate value of the Poisson's ratio of the material will be

(a) 0.25 (b) 0.31

(c) 0.45 (d) 0.20

[TSPSC - AE]

60. During tensile testing of a specimen using Universal Testing Machine, the parameters actually measured include

(a) True strain and true stress

(b) Young's modulus and Poisson's ratio

(c) Engineering stress and engineering strain

(d) Load and elongation

[TSPSC - AE]

61. The young's modulus of a material is 125 GPa and Poisson's ratio is 0.25. The modulus of rigidity of the material is

(a) 50 GPa (b) 30 GPa

(c) 5 GPa (d) 500 GPa

62. In a tensile test, when a material is stressed beyond elastic limit, the tensile strain _____ as compared to the stress.

(a) Decreases slowly

(b) Increases slowly

(c) Decreases more quickly

(d) Increases more quickly

63. The property which enables metals to be drawn into wire is

(a) Ductility

(b) Malleability

(c) Plastic deformation

(d) Elastic deformation

[CEMPM - 2018]

64. Proof resilience is the greatest stored energy at

(a) Limit of proportionality

(b) Elastic limit

(c) Plastic limit

(d) None of these

[NTPC-DIP - ME]

65. The ratio of modulus of elasticity (E) to modulus of rigidity (G) in terms of Poisson's ratio (μ) (in case of the elastic materials) is-

(a) $2(1 - \mu)$ (b) $2(1 + \mu)$

(c) $3(1 - 2\mu)$ (d) $0.5(1 \ \mu)$

[QP-Mechanical - I]

66. The property of a material to absorb energy within elastic limits is known as

(a) Elasticity (b) Toughness

(c) Tensile strength (d) Resilience

[QP-Mechanical - I]

67. Strain energy stored in a solid circular shaft is proportional to

(a) GJ(torsional rigidity)

(b) $1/(GJ)^2$

(c) (GJ)

(d) 1/(GJ)

[QP-Mechanical - I]

68. Isotropic materials are those which have the

(a) Different stressed induced in all direction

(b) Different thermal properties in all directions

(c) Same elastic property in all direction at a given point

(d) Different density throughout

[AEM]

69. The impact strength of a material is directly related to

(a) Tensile strength (b) Hardness

(c) Fatigue strength (d) Toughness

[AEM]

70. The linear relation between the stress and strain of a material is valid until

(a) Fracture stress (b) Elastic limit

(c) Ultimate stress (d) Proportional limit

[DRDO 2008]

71. In compression test, the cast iron speciman would :

(a) Would not fracture

(b) Fracture along at right angles to the axis of specimen

(c) Fracture along an oblique plane

(d) Fracture along the axis of load

[NMRC-JE-ME - 2017]

ANSWERS AND EXPLANATIONS

1. ***Ans. (d)***

2. ***Ans. (d)***

3. ***Ans. (d)***

4. ***Ans. (b)***

5. ***Ans. (c)***

6. ***Ans. (a)***

7. ***Ans. (a)***

8. ***Ans. (b)***

$$\frac{P}{\Delta V/V} = k = \frac{E}{3(1-2\mu)}$$

as $\mu \uparrow \rightarrow k \uparrow \rightarrow \Delta V \downarrow$

9. ***Ans. (a)***

10. ***Ans. (d)***

11. ***Ans. (b)***

12. ***Ans. (c)***

13. ***Ans. (b)***

14. ***Ans. (b)***

15. ***Ans. (b)***

16. ***Ans. (d)***

17. ***Ans. (c)***

18. ***Ans. (b)***

19. ***Ans. (a)***

20. ***Ans. (b)***

$$\sigma_{ultimate} = \frac{\text{load}}{\text{original cross sectional area}}$$

$$= \frac{8}{1} = 8 \text{ tonnes/cm}$$

21. ***Ans. (d)***

22. ***Ans. (b)***

23. ***Ans. (d)***

$$E = \frac{\sigma}{\varepsilon} \text{ when } \varepsilon = 1 \Rightarrow \sigma = E$$

24. ***Ans. (d)***

25. ***Ans. (b)***

26. ***Ans. (d)***

27. ***Ans. (c)***

28. ***Ans. (d)***

29. ***Ans. (d)***

30. ***Ans. (b)***

$$K = \frac{P}{\Delta V/V} = \frac{\sigma}{\varepsilon_v}$$

31. ***Ans. (b)***

32. ***Ans. (b)***

33. ***Ans. (a)***

34. ***Ans. (a)***

35. ***Ans. (a)***

36. ***Ans. (d)***

37. ***Ans. (d)***

38. ***Ans. (a)***

39. ***Ans. (d)***

40. ***Ans. (b)***

41. ***Ans. (b)***

42. ***Ans. (d)***

43. ***Ans. (b)***

44. ***Ans. (c)***

45. ***Ans. (a)***

46. ***Ans. (d)***

47. ***Ans. (c)***

48. ***Ans. (d)***

$$\mu = -\left(\frac{\text{Lateral strain}}{\text{Longitudinal strain}}\right)$$

$$\text{Lateral strain} = -\mu \text{ longitudinal strain}$$

49. ***Ans. (b)***

50. ***Ans. (b)***

51. ***Ans. (d)***

52. ***Ans. (b)***

53. ***Ans (c)***

Stress relaxation is decrease in stress in response to same amount of strain

This is because structure is kept in strained condition for some finite interval of time

54. ***Ans (b)***

55. ***Ans. (d)***

56. ***Ans. (a)***

$$E = 3k\,(1-2\mu)$$

57. ***Ans. (a)***

58. ***Ans. (b)***

$$E = 2C(1+\mu)$$

$$1.25 \times 10^{11} = 2C[1.34]$$

$$1.25 \times 10^{11} = 2.68 \times C$$

$$0.4664 \times 10^{5}\ \text{MPa} = C$$

59. ***Ans. (a)***

$$E = 2 \times 10^{6}\ \text{kg/cm}^2$$

$$C = 0.8 \times 10^{6}\ \text{kg/cm}^2$$

$$E = 2C(1+\mu)$$

$$2 \times 10^{6} = 2 \times 0.8 \times 10^{6}\,(1+\mu)$$

$$\frac{2}{1.6} = 1+\mu$$

$$1.25 = 1+\mu$$

$$\mu = 0.25$$

60. ***Ans. (d)***

61. ***Ans. (a)***

$$E = 2C\,(1+\mu)$$

$$125 = 2C\,[1.25]$$

$$125 = 2.50C$$

$$\frac{125}{2.50} = C$$

$$50 = C$$

62. ***Ans. (d)***

63. ***Ans. (a)***

64. ***Ans (b)***

Proof resilience : Energy stored upto elastic limit.

65. ***Ans. (b)***

66. ***Ans. (d)***

67. ***Ans. (d)***

$$(\text{Strain energy})_{\text{shaft}} = \frac{1}{2}\times T\times\theta \qquad \ldots(i)$$

From torsion equation

$$\frac{T}{J} = \frac{\tau_s}{R} = \frac{G\theta}{l}$$

$$\theta = \frac{TL}{GJ}$$

From equation (i)

$$(S.E)_{\text{shaft}} = \frac{1}{2}\times T\times\frac{TL}{GJ}$$

$$(S.E)_{\text{shaft}} \propto \frac{1}{GJ}$$

68. ***Ans. (c)***

Isotropic material = Same elastic property in all direction at a given point

69. ***Ans. (d)***

70. ***Ans. (d)***

71. ***Ans. (c)***

C.I is brittle material and brittle material along have fracture along oblique plane.

72. ***Ans. (a)***

$$I_{xx} = \frac{bd^3}{12} = \frac{80\times10^3}{12}$$

$$= 6666.66\ \text{mm}^4$$

73. ***Ans. (a)***

74. ***Ans. (c)***

75. ***Ans. (d)***

76. ***Ans. (a)***