

Ph. D. ENTRANCE TEST (PET) 2025

Signature of Invigilator

Paper - II

Roll.
No.

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Applied Mechanics And
Structural Engineering

Maximum Marks: 50

No. Of Printed Pages: 8

Instruction for the Candidate:

1. This paper consists of **FIFTY (50)** multiple choice type questions. Each Question carries **ONE (1)** mark.
2. There is no Negative Marking for Wrong Answer.
3. A separate OMR Answer Sheet has been provided to answer questions. Your answers will be evaluated based on your response in the OMR Sheet only. No credit will be given for any answering made in question booklet.
4. Defective question booklet or OMR if noticed may immediately replace by the concerned invigilator.
5. Write roll number, subject code, booklet type, category and other information correctly in the OMR Sheet else your OMR Sheet will not be evaluated by machine.
6. Select most appropriate answer to the question and darken appropriate oval on the OMR answer sheet, with black / blue ball pen only. **DO NOT USE PENCIL** for darkening. In case of over writing on any answer, the same will be treated as invalid. Each question has exactly one correct answer and has four alternative responses (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
Example: (A) ● (B) ● (C) ● (D) ● where (B) is correct response.
7. Rough Work is to be done in the end of this booklet.
8. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
9. Calculators, Log tables any other calculating devices, mobiles, slide rule, text manuals etc are **NOT** allowed in the examination hall. If any of above is seized from the candidates during examination time; he/ she will be immediately debarred from the examination and corresponding disciplinary action will be initiated by the Center Supervisor as deemed fit.
10. **DO NOT FOLD** or **TEAR** OMR Answer sheet as machine will not be able to recognize torn or folded OMR Answer sheet.
11. **You have to return the OMR Answer Sheet to the invigilator at the end of the examination compulsorily** and must not carry it with you outside the Examination Hall. You are however, allowed to carry original question booklet on conclusion of examination.

Paper - II

Applied Mechanics And Structural Engineering

Note: This paper contains **FIFTY (50)** multiple-choice questions. Each Question carries **ONE (1)** mark.

- 01) A simply supported beam with overhang on one side and subjected to vertical downward loading is classified as _____.
- A) Stable and determinate
 - B) Unstable and determinate
 - C) Stable and indeterminate
 - D) Unstable and indeterminate
- 02) Two span continuous beam with extreme left and right supports as fixed is subjected to full UDL. The deflected pattern of this beam will have _____ points of contraflexure.
- A) 2
 - B) 3
 - C) 1
 - D) 4
- 03) "Partial derivative of bending strain energy with respect to support reaction is always minimum" is the statement of _____.
- A) Min potential energy formula
 - B) Castigliano's second theorem
 - C) Hardy cross constant
 - D) Kinetic energy formula
- 04) A three hinged parabolic arch (ACB) subjected to downward central point load (W) at crown C will be having _____.
- A) Maximum Sagging BM below the load
 - B) Sagging BM in each AC & CB portion
 - C) Hogging BM in each AC & CB portion
 - D) Sagging in AC & Hogging in CB portion
- 05) The internal force in each member of plane truss can be found out by ____.
- A) Method of section
 - B) Method of half section
 - C) Method of vertical section
 - D) Method of tension coefficient
- 06) The shape of shear force diagram for the Cantilever beam subjected to full UDL is _____.
- A) Rectangular with clockwise in nature
 - B) Square with clockwise in nature
 - C) Triangular with clockwise in nature
 - D) Parabolic with anticlockwise in nature
- 07) The value of δ_{max} for the fixed beam subjected to central point load (P) is equals to _____. (Consider span = L and flexural rigidity = EI)
- A) $PL^3/3EI$
 - B) $PL^3/48EI$
 - C) $PL^3/68EI$
 - D) $PL^3/192EI$
- 08) "The moment of a force about any point is equal to the sum of the moments of the components of the force about the same point" is the statement of which theorem / principle ?
- A) Principle of transmissibility
 - B) Betti's theorem
 - C) Principle of vortual work
 - D) Varignon's theorem
- 09) If P_1 and P_2 are the forces acting at a point and inclined at an angle of θ , the resultant, R of the forces according to law of parallelogram is given by,
- A) $\sqrt{P_1^2 + P_2^2 + 2.P_1.P_2.\cos\theta}$
 - B) $\sqrt{P_1^2 - P_2^2 - 2.P_1.P_2.\cos\theta}$
 - C) $\sqrt{P_1^2 - P_2^2 + 2.P_1.P_2.\cos\theta}$
 - D) $\sqrt{P_1^2 + P_2^2 - 2.P_1.P_2.\cos\theta}$

- 10) Which of the following are equations of equilibrium for coplanar non-concurrent force systems?
- A) $\sum F_x = 0, \sum F_y = 0$
- B) $\sum F_x = 0, \sum F_y = 0, \sum F_z = 0$
- C) $\sum M_x = 0, \sum M_y = 0$
- D) $\sum F_x = 0, \sum F_y = 0, \sum M_z = 0$
- 11) In equilibrium of three coplanar concurrent forces, which of the following theorem is useful?
- A) Lami's theorem
- B) Lame's theorem
- C) Varignon's theorem
- D) Maxwell theorem
- 12) The internal actions due to general loads in the rigid jointed plane frame are;
- A) Shear force, Bending moment and Twisting moment
- B) Axial force and Shear force
- C) Axial Force, Shear force and Bending moment
- D) Bending moment and Twisting moment
- 13) What is the relation between angle of static friction (ϕ_s) and coefficient of static friction (μ_s).
- A) $\mu_s = \cot \phi_s$
- B) $\mu_s = \tan \phi_s$
- C) $\mu_s = \sin \phi_s$
- D) $\mu_s = \cos \phi_s$
- 14) IS 15962:2012 focuses on _____.
- A) Structural steel for buildings with improved seismic resistance
- B) Hollow steel sections for structural use
- C) Cold formed steel section for structural use
- D) Guideline for installation of steel pipes.
- 15) The coefficient of temperature expansion (α_t) for structural steel is equals to _____.
- A) $12 \times 10^{-6} / ^\circ\text{C}$
- B) $19 \times 10^{-6} / ^\circ\text{C}$
- C) $12 \times 10^{-6} / ^\circ\text{C}$
- D) $1.5 \times 10^{-6} / ^\circ\text{C}$
- 16) The angle of the rough plane (with horizontal surface) at which the mass kept on it is just on the point of sliding down is called,
- A) Angle of repose
- B) Angle of internal friction
- C) Angle of inclination
- D) Angle of sliding
- 17) Toughness of steel can be found by _____ test.
- A) Brinell
- B) Rockwell
- C) Izod Impact
- D) Shear
- 18) The minimum and maximum weight of cement per cubic meter of concrete in mix design procedure is _____ kgs.
- A) 240 & 300
- B) 240 & 400
- C) 300 & 450
- D) 240 & 425
- 19) The target strength of M25 grade of concrete for mix design procedure is considered as _____ N/mm².
- A) 31.5
- B) 25
- C) 25.55
- D) 31.6
- 20) Prime structural strength of burnt brick masonry in building is _____.
- A) Tensile
- B) Shear
- C) compressive
- D) bending

- 21) _____ approach is the simplest laboratory procedure to calculate modulus of elasticity of timber specimen.
- Axial loading
 - Deflection
 - Shearing
 - Lateral pressure
- 22) Which of the following failure theories is useful for Brittle materials?
- Maximum principal stress theory
 - Maximum shear stress theory
 - Maximum total strain energy theory
 - Maximum distortion energy theory
- 23) According to Tresca's theory, yield locus for two-dimensional stress system is _____.
- circle
 - rectangle
 - hexagon
 - ellipse
- 24) A vertical prismatic bar having cross sectional area 'A', length 'L' and total weight W, is fixed at the top and free at the bottom. The maximum axial deformation at the free end of this bar due to its self-weight is _____.
- WL/AE
 - W/A
 - $WL/(2AE)$
 - $WA/(EL)$
- 25) Which of the following is the relation between material constants E, G and K?
- $E(2K+G) = 9GK$
 - $E(3K+G) = 9GK$
 - $E(K+3G) = 9GK$
 - $E(K+2G) = 9GK$
- 26) A rectangular bar of width b and depth d is being used as a cantilever beam. The loading is parallel to width b. The section modulus required to calculate the bending stress in this beam is _____.
- $bd^3/12$
 - $bd^2/6$
 - $db^2/6$
 - $db^3/12$
- 27) If a shaft rotates at 120 rpm under a torque of 1200 Nm, the power transmitted is,
- 15π kW
 - 10π kW
 - 4.8π kW
 - 6.6π kW
- 28) The maximum shear stress (τ) induced in the hollow circular shaft having internal and external diameters d_i and d_o and subjected to torque T is given by,
- $\frac{16T}{\pi(d_o^3-d_i^3)}$
 - $\frac{16T}{\pi(d_o^4-d_i^4)}$
 - $\frac{16Td_o}{\pi(d_o^3-d_i^3)}$
 - $\frac{16Td_o}{\pi(d_o^4-d_i^4)}$
- 29) The maximum strain in concrete at extreme compression fiber is taken as _____ in RC beam design theory.
- 0.00035
 - 0.47fck
 - 0.67
 - 0.0035
- 30) Whenever the bending moment required to be resisted is more than the moment of resistance of balanced section of singly reinforced beam, which of the following options should be selected?
- use of Over-reinforced or doubly reinforced section
 - Reduce factor of safety with load factor
 - Remodify partial safety factor
 - None of them above.
- 31) Minimum reinforcement in RCC slab design is always provided to control _____.
- Maximum deflection
 - bending
 - cracking
 - None of the above
- 32) The maximum diameter of reinforcement in design of RCC slab must be _____ times the thickness of slab.
- 1/3
 - 1/8
 - 1/4
 - 1/10

- 33) The corner steel provision in RCC slab is always known as _____.
- Flexural main reinforcement
 - Shear main reinforcement
 - Torsional reinforcement
 - Transverse shear reinforcement.
- 34) Newmark's influence chart is used for
- rectangular loading condition
 - loaded area of any shape
 - strip loading
 - circular loaded area
- 35) For fully saturated soil mass, the Skempton's pore pressure parameter, B is
- nearly zero
 - nearly 0.5
 - nearly 1
 - nearly infinite (∞)
- 36) In the friction circle method, the radius of the friction circle is given by (ϕ is mobilised angle of internal friction)
- $r \tan \phi$
 - $r \cos \phi$
 - $r \sin \phi$
 - r
- 37) If the unit weight of soil is 20 kN/m^3 , cohesion is 15 kN/m^2 , factor of safety is 1.5 and the stability number is 0.05, the safe maximum height of the slope is
- 5.0 m
 - 8.0 m
 - 10.0 m
 - 12.0 m
- 38) If an SPT test gave the average blow count of 32 with overburden correction in fine sand below water table, what is the corrected value of blow count?
- 22.5
 - 23.5
 - 24.2
 - 32
- 39) A footing $2\text{m} \times 1\text{m}$ exerts a uniform pressure of 150 kN/m^2 on the soil. Assuming a load dispersion of 2 vertical to 1 horizontal, the average vertical stress (kN/m^2) at 1m below the footing is,
- 50
 - 75
 - 80
 - 100
- 40) Soils in a broader way can be classified as _____.
- Residual & transported soil
 - Black cotton soil
 - Cohesive soil
 - Cohesionless soil
- 41) The cohesionless soil is generally formed due to _____.
- Chemical decomposition
 - Physical disintegration
 - Oxidation
 - Hydration.
- 42) The soil has bulk density 44 kN/m^3 and water content 10%. Its dry density will be _____ kN/m^3 .
- 4.4
 - 10
 - 20
 - 40
- 43) Quick clay can have sensitivity equal to.
- 0
 - 1
 - 20
 - Infinity
- 44) The soil composed of three layers each of height 'h', is having permeability of k , $2k$ & k respectively. The equivalent permeability in vertical direction is _____.
- $6k/5$
 - $5/2k$
 - $2k/5$
 - $4k$

- 45) The steel parts at right angle, are welded with fillet weld of 10 mm size. The throat thickness of the fillet weld should be
- 7 mm
 - 12 mm
 - 10 mm
 - 5 mm
- 46) The effective slenderness ratio for single angle strut is given by ____ .
- $[k_1 + k_2\lambda_{vv}^2 + k_3\lambda_\phi^2]^{1/2}$
 - $k_1 + k_2\lambda_{vv} + k_3\lambda_\phi$
 - $[\lambda_{vv}^2 + \lambda_\phi^2]^{1/2}$
 - $k_1\lambda_\phi + k_2\lambda_{vv}$
- 47) In case of sheared or hand flame cut edges the minimum edge distance from the center of bolt hole to the nearest edge of the plate is
- 1.5 times hole diameter
 - 1.7 times hole diameter
 - 1.7 times nominal diameter of bolt
 - 1.5 times nominal diameter of bolt
- 48) As per IS 800: 2007, the nominal shear strength of web of steel girder as governed by web buckling can be obtained by
- tension coefficient method
 - shear center method
 - lame's method
 - simple post-critical method
- 49) For a laterally unsupported steel beam, the design bending strength, M_d is function of
- design axial compressive stress
 - design bending compressive stress
 - design bending tensile stress
 - design axial tensile stress
- 50) In the laced built-up column the slenderness ratio, kL/r of lacing bar shall not exceed _____.
- 120
 - 180
 - 250
 - 145

Rough Work: