ENTRANCE EXAMINATION – 2020

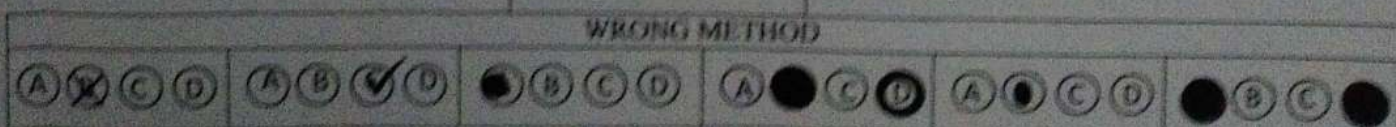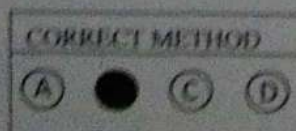## SET B

ROLL N

Signature of Invigilator

Time : 1 HOUR 30 MINUTES   **Total Marks : 100**

Instructions to Candidates

1. Do not write your name or put any other mark of identification anywhere in the OMR Response Sheet. IF ANY MARK OF IDENTIFICATIONS IS DISCOVERED ANYWHERE IN OMR RESPONSE SHEET, the OMR sheet will be cancelled, and will not be evaluated.

2. **This Question Booklet contains the cover page and a total of 100 Multiple Choice Questions of 1 mark each**

3. Space for rough work has been provided at the beginning and end. Available space on each page may also be used for rough work.

4. There is negative marking in Multiple Choice Questions. For each wrong answer, 0.25 marks will be deducted.

5. USE/POSSESSION OF ELECTRONIC GADGETS LIKE MOBILE PHONE, iPhone, iPad, pags ETC. is strictly PROHIBITED.

6. Candidate should check the serial order of questions at the beginning of the test. If any question is found missing in the serial order, it should be immediately brought to the notice of the Invigilator. No pages should be torn out from this question booklet.

7. Answers must be marked in the OMR response sheet which is provided separately. OMR Response sheet must be handed over to the invigilator before you leave the seat.

8. The OMR response sheet should not be folded or wrinkled. The folded or wrinkled OMR/Response Sheet will not be evaluated.

9. Write your Roll Number in the appropriate space (above) and on the OMR Response Sheet. Any other details, if asked for, should be written only in the space provided.

10. There are four options to each question marked A, B, C and D. Select one of the most appropriate options and fill up the corresponding oval/circle in the OMR Response Sheet provided to you. The correct procedure for filling up the OMR Response Sheet is mentioned below.

CORRECT METHOD

Ⓐ ● Ⓒ Ⓓ

WRONG METHOD

Q1. While converting a beam into its conjugate one, end supports remain same. This statement is:-

A. always true
B. always false
C. can't say
D. depends upon type of load

Q2. In a body loaded under plane stress conditions, what is the number of independent stress components?

A. 1
B. 2
C. 3
D. 6

Q3. A material has a Poisson's ratio of 0.5. If uniform pressure of 300 GPa is applied to that material, What will be the volumetric strain of it?

A. 0.50
B. 0.20
C. 0.25
D. 0

Q4. When the strain in a material increases with time under sustained constant stress, the phenomenon is known as

A. Visco-elasticity
B. Hysteresis
C. Strain hardening
D. Creep

Q5. The shear stress at the neutral axis of the cross-section of a beam is

A. zero
B. minimum
C. maximum
D. none of these

Q6. A steel circular bar of 5 mm diameter is heated from 15° C to 40° C and it is restrained at the ends to expand. The bar will induce

A. no stress
B. shear stress
C. tensile stress
D. compressive stress

Q7. The ratio of Young's modulus to modulus of rigidity for a material having Poisson's ratio 0.2 is

A. 12/5
B. 5/12
C. 5/14
D. 14/5

Q8. If the depth is kept constant for a beam of uniform strength, then its width will vary in proportional to bending moment M

A. $1/M$
B. M
C. M^2
D. M^3

Q9. The energy stored in a body when strained within elastic limit is known as
A. Resilience
B. proof resilience
C. strain energy
D. impact energy

Q10. In compression test, the fracture in cast iron specimen would occur along
A. the axis of load
B. an oblique plane
C. at right angles to the axis of specimen
D. would not occur

Q11. The bending moment at a point on a beam is the algebraic _____ of all the moments on either side of the point.
A. sum
B. difference
C. product
D. quotient

Q12. The stress induced in a body, when suddenly loaded, is _____ the stress induced when the same load is applied gradually.
A. equal to
B. one-half
C. twice
D. four times

Q13. A body is subjected to a direct tensile stress (σ) in one plane. The shear stress is maximum at a section inclined at _____ to the normal of the section.
A. 45° and 90°
B. 45° and 135°
C. 60° and 150°
D. 30° and 135°

Q14. Two shafts 'A' and 'B' are made of same material. The shaft 'A' is of diameter D and shaft 'B' is of diameter $D/2$. The strength of shaft 'B' is _____ as that of shaft 'A'
A. one-eighth
B. one-fourth
C. one-half
D. four times

Q15. Compression members always tend to buckle in the direction of the
A. axis of load
B. perpendicular to the axis of load
C. minimum cross section
D. least radius of gyration

Q16. Euler's formula holds good only for
A. short columns
B. long columns
C. both short and long columns
D. none of these

Q17. A body is subjected to a tensile stress of 1200 MPa on one plane and another tensile stress of 600 MPa on a plane at right angles to the former. It is also subjected to a shear stress of 400 MPa on the same planes. The maximum normal stress will be
A. 400 MPa
B. 500 MPa
C. 900 MPa
D. 1400 MPa

Q18. 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

Q19. The elastic section modulus of a circular section having diameter d about an axis through its C.G., is
A. $\pi d^2/4$
B. $\pi d^2/16$
C. $\pi d^3/16$
D. $\pi d^3/32$

Q20. A simply supported beam of span L with a gradually varying load from zero at one end to 'W' per unit length at other end. The maximum shear force induced in beam is equal to
A. WL/6
B. WL/3
C. WL
D. 2WL/3

Q21. The assumption made in Euler's column theory is that
A. the failure of column occurs due to buckling alone
B. the length of column is very large as compared to its cross-sectional dimensions
C. the column material obeys Hooke's law
D. all of the above

Q22. The torque transmitted by a solid shaft of diameter (D) is (where τ = maximum allowable shear stress)
A. $\pi/4 \times \tau \times D^3$
B. $\pi/16 \times \tau \times D^3$
C. $\pi/32 \times \tau \times D^3$
D. $\pi/64 \times \tau \times D^3$

Q23. If T_h is the torque resisting capacity of a hollow shaft and T_s is that of a solid shaft, of the same material, length and weight. Then,
A. $T_h > T_s$
B. $T_h < T_s$
C. $T_h = T_s$
D. none of these

Q24. After reaching the yielding stage while testing a mild steel specimen, strain
A. becomes constant
B. starts decreasing
C. increases without any increase in load
D. none of the above

Q25. When a shaft of isotropic material is subjected to a twisting moment, every cross-section of the shaft will be under
A. tensile stress
B. compressive stress
C. shear stress
D. none of these

Q26. The example of smart material is
A. brick
B. piezoelectric
C. sand
D. cement

Q27. The smart material can be applied in structures for
A. controlling deflection
B. measuring deflection
C. controlling forces
D. all of the above

Q28. The advantages of ferrocement are
A. resistance against earthquake
B. fabricated into any desired shape
C. low weight and long lifetime
D. all of the above

Q29. The method of seasoning by which most uniform seasoning of timber is possible
A. water
B. air
C. electric
D. kiln

Q30. The expansion and shrinkage of plywoods are comparatively very low as
A. they are held in position by adhesive
B. they are glued under pressure
C. plies are placed right angles to each other
D. none of the above

Q31. Quick setting cement is produced by adding
A. less amount of gypsum in very fine powdered form
B. more amount of gypsum in very fine powdered form
C. aluminium sulphate in very fine powdered form
D. pozzolana in very fine powdered form

Q32. Initial setting time of cement is due to action of
A. C_3S
B. C_2S
C. C_3A
D. Both (A) and (B)

Q33. Vicat's apparatus is used to find which of the following of cement
A. setting time
B. specific gravity
C. porosity
D. tensile strength

Q34. What property does air-entraining cement provide?
A. workability
B. soundness
C. fineness
D. none of the above

Q35. Bleeding can be reduced by
A. increasing cement content
B. increasing sand content
C. using finer sand
D. all the above

Q36. A simply supported beam having internal hinge is a
A. structure
B. mechanism
C. elastic body
D. none of these

Q37. In flexibility methods, unknown quantities are
A. forces
B. displacement
C. rotation
D. none of these

Q38. A beam is hinged at end A and fixed at B. Moment M is applied at end A. What is the moment developed at end B?
A. -M
B. M
C. M/2
D. -M/2

Q39. A cantilever beam is subjected to a point load at the free end. At the free end,
A. the slope and deflection are zero
B. the moment and shear are zero
C. the moment is zero but not shear
D. the shear is zero but not the moment

Q40. For a simply supported beam of span 20 m, ILD is drawn for B.M. at section of 5 m from the left hand support. The maximum moment (in kN-m) at the section due to moving point load of 200 kN, is equal to
A. 700
B. 750
C. 800
D. 850

Q41. Muller-Breslau Principle is applicable to get influence line for which one of the following
A. forces
B. moments
C. forces and moments
D. none of the above

Q42.   In which of the following cases, the dynamic system has no oscillation but returns to equilibrium at a slower rate?
A.   critically damped case
B.   over damped case
C.   under damped case
D.   none of the above

Q43.   The steady state response is maximum when the frequency ratio is
A. < 1
B. > 1
C. $= 1$
D. $= \sqrt{2}$

Q44.   Natural frequency of the system depends on
A.   mass
B.   stiffness
C.   both A and B
D.   excitation

Q45.   The transient motion lasts for
A.   entire duration of excitation force
B.   short duration at the beginning
C.   short duration at the end
D.   short duration at the middle

Q46.   The steady state motion depends predominantly on
A.   natural frequency
B.   damped natural frequency
C.   excitation frequency
D.   none of the above

Q47.   At resonance, the transmissibility only depends on
A.   natural frequency
B.   damped natural frequency
C.   excitation frequency
D.   damping ratio

Q48.   In the slope deflection equations, the deformation in beam is neglected due to
A.   bending moment
B.   shear force
C.   axial force
D.   both B and C

Q49.   Which of the following methods of structural analysis is a displacement method?
A.   Moment distribution method
B.   Column analogy method
C.   Three moment equation
D.   none of the above

Q50.   The three moments equation is not applicable only when
A.   the beam is prismatic
B.   there is no settlement of supports
C.   there is discontinuity such as hinges within the span
D.   the spans are equal

M-49/SET B

Q51. The principle of virtual work can be applied to elastic system by considering the virtual work of
A. internal forces only
B. external forces only
C. internal as well as external forces
D. none of the above

Q52. The deflection at any point of a frame can be obtained by applying a unit load at the joint in
A. vertical direction
B. horizontal direction
C. inclined direction
D. the direction in which the deflection is required

Q53. When a uniformly distributed load, longer than the span of the girder, moves from left to right, the the maximum bending moment at mid-section of span occurs when the uniformly distributed loa occupies
A. less than the left half span
B. whole of left half span
C. more than the left half span
D. whole span

Q54. The Castigliano's second theorem can be used to compute deflection
A. in statically determinate structures only
B. at the point under the load only
C. for beams and frames only
D. all of these

Q55. Independent displacement components at each joint of a rigid-jointed plane frame are
A. three linear movements
B. two linear movements and one rotation
C. one linear movement and two rotations
D. three rotations

Q56. Effects of shear force and axial force on plastic moment capacity of a structure are respectively to
A. decrease and decrease
B. increase and increase
C. decrease and increase
D. increase and decrease

Q57. A single rolling load of 8 kN rolls along a girder of 15 m span. The absolute maximum bending moment will be
A. 8 kN.m
B. 15 kN.m
C. 30 kN.m
D. 60 kN.m

Q58. The deformation of a spring produced by a unit load is called
A. stiffness
B. flexibility
C. influence coefficient
D. unit strain

Q59. In moment distribution method, the sum of distribution factors of all the members meeting at any joint is always

A. 1
B. 2
C. 0
D. -1

Q60. If a structure is statically indeterminate to second degree, then the maximum number of plastic hinges required to render the structure a mechanism is

A. 1
B. 2
C. 3
D. infinite

Q61. Which of the following section will have the large shape factor?
A. rectangular
B. I section
C. solid circular section
D. diamond

Q62. The shape factor for a solid circular section subjected to bending about its diameter is
A. 1.12
B. 1.5
C. 1.7
D. 2.0

Q63. A propped cantilever AB of length L is fixed at A and B is propped subjected to u.d.l. over the whole beam. The plastic hinge will form at

A. B
B. at L/2 from B
C. at 0.414L from B
D. at 0.414L from A

Q64. The plastic section modulus of a rectangular section of width b and depth d is
A. $bd^2/3$
B. $bd^2/4$
C. $bd^2/6$
D. $bd^2/12$

Q65. At a fully plastic section, infinite rotation can occur at
A. zero moment
B. constant elastic moment
C. constant plastic moment
D. None of the above

Q66. The rectangular beam of width 250 mm is having effective depth of 317 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The moment capacity of the section due to concrete as per limit state method is :
A. 52.046 kNm
B. 69.395 kNm
C. 86.744 kNm
D. 104.093 kNm

Q67. The rectangular beam of width 250 mm is having effective depth of 317 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. As per limit state method, the position of neutral axis from compression side is:

A. 152 mm
B. 178 mm
C. 203 mm
D. 254 mm

Q68. The rectangular beam of width 300 mm is having overall depth of 400 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The tensile reinforcement is provided by 4-20 mm diameter bars. In the compression side, the reinforcement is provided by 2-12 mm diameter bars. The clear cover is 25 mm. The effective depth (mm) is :

A. 365
B. 315
C. 320
D. 361

Q69. The partial safety factor to be used in limit state of deflection is
A. 1
B. 1.2
C. 1.5
D. 0.9

Q70. x_u/d is greater than the limiting value of section, the type of failure occurs
A. ductile
B. brittle
C. either of the above
D. none of the above

Q71. Which of the following is not a limit state of serviceability
A. deflection
B. compression
C. cracking
D. vibration

Q72. In limit state method, stress in compression steel is based on
A. strain in concrete at its level
B. stress in tension steel
C. strain in tension steel
D. none of the above

Q73. Failure of RCC beam due to shear can only occur on account of
A. web compression
B. flange compression
C. diagonal compression
D. diagonal tension

Q74. Post tensioning system
A. was widely used in earlier days
B. is not economical and hence not generally used
C. is economical for large spans and is adopted nowadays
D. none of these

Q75. In a situation where torsion is dominant, which one of the following is the desirable section
A. box type
B. T
C. channel
D. angle

Q76. Steel structures are highly suitable for impact loads because they have high
A. toughness
B. elastic modulus
C. Poisson's ratio
D. none of the above

Q77. A steel plate under tensile load is 300 mm wide and 10 mm thick. An unfinished bolt of M18 is driven in to it. The net sectional area (mm^2) of the plate is
A. 2900
B. 2700
C. 2800
D. 2600

Q78. The rectangular beam of width 300 mm is having overall depth of 400 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The tensile reinforcement is provided by 4-20 mm diameter bars. In the compression side, the reinforcement is provided by 2-12 mm diameter bars. The clear cover is 25 mm. The strain in compression steel is
A. 0.0035
B. 0.0029
C. 0.00144
D. 0.00163

Q79. Web crippling in steel beam occur due to
A. excessive moment
B. excessive shear
C. failure of web under heavy concentrated load
D. none of the above

Q80. The concept of economical depth of plate girder is based on
A. minimum width
B. minimum depth
C. minimum weight
D. minimum thickness of flange

Q81. The self-weight of roof truss of span 30 m in N/m^2 is calculated from empirical formula as
A. 0.150
B. 250
C. 200
D. 150

Q82. In designing, the purlins are assumed to be
A. overhang
B. cantilever
C. continuous
D. simply supported

Q83. The moment of resistance of a balanced reinforced concrete beam is based on the stresses in
A. steel only
B. concrete only
C. steel and concrete both
D. none of these

Q84. In case of an under-reinforced beam, the depth of actual neutral axis is _____ that of the critical neutral axis.
A. same as
B. less than
C. greater than
D. none of these

Q85. The imperfection factor for welded steel section is
A. 0.49
B. 0.21
C. 0.35
D. 0.42

Q86. The black cotton soils exhibit high shrinkage and expansive qualities due to the presence of clay minerals of group
A. halloysite
B. illite
C. kaolinite
D. montomorillonite

Q87. In the classification of soils, clayey sand can be designated as
A. CF
B. SC
C. CG
D. CL

Q88. In case of foundations on black cotton soils, the most suitable method to increase the bearing capacity of soils is to
A. increase the depth of foundation
B. drain the soil
C. compact the soil
D. replace the poor soil

Q89. The relative density of a soil having maximum dry density = 2.0, minimum dry density = 1.20, normal dry density = 1.6 is
A. 66.67 %
B. 62.50 %
C. 75 %
D. 50 %

$$\gamma - ? \qquad \frac{2-1.6}{2-1.2} = \frac{.4}{.8}$$

Q90. The ratio of void ratios of two saturated soils specimens having same specific gravity and water contents in the ratio of 2 is
A. 2
B. 1/2
C. 1/3
D. 1/4

$$e = \frac{w}{\sqrt{s}} \qquad e$$

$$\omega - ? \ \frac{V_\omega}{\sqrt{s}}$$

Q91. A rectangular footing 1 m X 2 m is placed at a depth of 2 m in saturated clay having an unconfined compressive strength of 100 kN/m². According to Skempton, the ultimate bearing capacity (kN/m²) is

A. 420
B. 412.5
C. 385
D. 330

Q92. The minimum water content at which the soil just begins to crumble when rolled into threads 3.2 mm in diameter, is known

A. liquid limit
B. plastic limit
C. shrinkage limit
D. permeability limit.

Q93. For a sandy soil, the angle of internal friction is 30°. If the major principal stress is 50 kN/m² at failure, then the corresponding minor principal stress (in kN/m²) will be

A. 12.2
B. 20.8
C. 13.2
D. 16.66

Q94. A grillage foundation
A. is provided for heavily loaded isolated columns
B. is treated as spread foundation
C. consists of two sets of perpendicularly placed steel beams
D. all the above

Q95. Which of the following is an example of slopes extending to infinity?
A. inclined face of earth dams
B. embankments
C. cuts
D. none of the mentioned above

Q96. The principle of superposition is valid only if the material is
A. elastic
B. stress strain relationship is linear
C. plastic
D. elasto-plastic

Q97. A closed funicular polygon of forces acting on a body indicates
A. forces and moments are in equilibrium
B. forces are in equilibrium
C. the body does not rotate
D. no relevance with regard to forces

Q98. What force is required to punch a 20-mm-diameter hole in a plate that is 25 mm thick? The shear strength is 350 MN/m²,
A. 550 kN
B. 550 MN
C. 550 N
D. 419.8 kN

Q99. Moment area method yields
A. only deflection at a section
B. only slope at a section
C. slopes and deflections
D. none of these

Q100. The ratio of deflection at centre of a fixed beam and a simply supported beam under a concentrate
load P at the centre of the span is
A. 0.20
B. 0.25
C. 0.50
D. 0.75

$$Mu = 0.36\, fck\, bd^2$$
$$= 0.36 \times 20 \times 250 \times 317^2$$