

2105 - CCE(P) - 2015  
CIVIL ENGINEERING

KTM-07-XV

**DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO**

Subject Code :

0 7

Test Booklet No. : 00748

## TEST BOOKLET CIVIL ENGINEERING

Time Allowed : 2 (Two) Hours

Full Marks : 200

### INSTRUCTIONS

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Subject Code shall be written legibly and correctly in the space provided on the Answer Sheet with black ball pen.
2. **Space provided for Series in the Answer Sheet is not applicable for Optional Subject. So the space shall be left blank.**
3. All questions carry equal marks. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet.
4. No candidate shall be admitted to the Examination Hall/Room 20 minutes after commencement of distribution of the paper. The Supervisor of the Examination Hall/Room will be the time-keeper and his/her decision in this regard is final.
5. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/Invigilator. No candidate shall be permitted to hand over his/her Answer Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
6. No Mobile Phone, Pager, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Pager, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
7. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected paper permitted by the Commission.
8. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
9. After you have completed filling in all your responses on the Answer Sheet and the Examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
10. Violation of any of the above Rules will render the candidate liable to expulsion from the Examination Hall/Room and disqualification from the Examination, and according to the nature and gravity of his/her offence, he/she may be debarred from future Examinations and Interviews conducted by the Commission for appointment to Government Service.
11. Smoking inside the Examination Hall/Room is strictly prohibited.
12. **This Test Booklet contains one page for Rough Work at the end.**

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[ No. of Questions : 100 ]

SEAL



1. Which of the following is a scalar quantity?

- (A) Momentum
- (B) Impulse
- (C) Energy
- (D) Torque

2. One megapascal is equal to

- (A)  $10^6 \text{ N/m}^2$
- (B)  $1 \text{ kgf/m}^2$
- (C)  $1 \text{ N/mm}^2$
- (D)  $1 \text{ N/m}^2$

3. The centre of gravity of a quadrant of a circle lies along its central radius  $R$  at a distance of

- (A)  $\frac{2R}{3\pi}$
- (B)  $\frac{4R}{3\pi}$
- (C)  $\frac{8R}{3\pi}$
- (D)  $\frac{2\pi R}{3}$

4. The ratio of moment of inertia of a rectangle to that of a triangle having same base and height about their bases is

- (A) 1
- (B) 2
- (C) 3
- (D) 4

5. When a beam is loaded transversely, the maximum bending compressive stress develops on

- (A) top fibre
- (B) bottom fibre
- (C) neutral axis
- (D) the section passing through the c.g.

6. A simply supported beam carries two equal concentrated loads  $W$  at distances  $L/3$  from either support. The maximum bending moment in the beam will be

- (A)  $\frac{WL}{2}$
- (B)  $\frac{WL}{3}$
- (C)  $\frac{WL}{6}$
- (D)  $\frac{WL}{8}$

7. A cantilever beam having moment of inertia  $I$ , modulus of elasticity  $E$  and length  $L$  carries a uniformly distributed load  $w$  per unit run over the entire span. The deflection at the free end will be

- (A)  $\frac{wL^4}{8EI}$
- (B)  $\frac{wL^4}{3EI}$
- (C)  $\frac{wL^3}{3EI}$
- (D)  $\frac{wL^3}{8EI}$



8. A 60 mm diameter shaft is subjected to a torque of 4 kN-m. The maximum shear stress induced in the shaft is

- (A) 47.15 N/mm<sup>2</sup>
- (B) 94.30 N/mm<sup>2</sup>
- (C) 23.60 N/mm<sup>2</sup>
- (D) 69.08 N/mm<sup>2</sup>

9. A solid shaft 125 mm in diameter transmits 120 kW at 160 r.p.m. The mean torque to which the shaft is subjected is approximately

- (A) 7162 N-m
- (B) 7.2 N-m
- (C) 93.75 N-m
- (D) 15 N-m

10. A rectangular bar is subjected to an axial tensile load producing a tensile stress  $p$  on a section normal to the axis of loading. The tangential stress induced on any oblique plane at an angle  $\theta$  to the cross-section is

- (A)  $p \cos^2 \theta$
- (B)  $\frac{p}{2} \cos 2\theta$
- (C)  $\frac{p}{2} \sin 2\theta$
- (D)  $\frac{p}{2} \sin^2 \theta$

11. The shear force diagram for a cantilever beam carrying uniformly distributed load per unit length will be a/an

- (A) rectangle
- (B) isosceles triangle
- (C) right-angled triangle
- (D) parabola

12. When two unequal like principal stresses  $p_1$  and  $p_2$  act, then the radius of Mohr's circle will be

- (A)  $\frac{p_1 + p_2}{2} \cos \theta$
- (B)  $\frac{p_1 - p_2}{2} \cos \theta$
- (C)  $\frac{p_1 + p_2}{2}$
- (D)  $\frac{p_1 - p_2}{2}$

13. For a column of actual length  $l$  whose both ends are fixed, the crippling load is

- (A)  $\frac{\pi^2 EI}{4l^2}$
- (B)  $\frac{4\pi^2 EI}{l^2}$
- (C)  $\frac{2\pi^2 EI}{l^2}$
- (D)  $\frac{\pi^2 EI}{2l^2}$



14. If a stable simply supported beam has roller support at one end, then the other end will be

- (A) free
- (B) fixed
- (C) hinged
- (D) on rollers

15. The ratio of average shear stress to maximum shear stress for a circular section is

- (A) 2
- (B)  $\frac{2}{3}$
- (C)  $\frac{1}{2}$
- (D)  $\frac{3}{4}$

16. What will be the relation between  $E$  (Young's modulus) and  $K$  (bulk modulus) when  $\mu$  (Poisson's ratio) is 0.25?

- (A)  $E = K$
- (B)  $E = 2K$
- (C)  $E = 1.5K$
- (D)  $E = K = 0$

17. If a shaft of diameter  $d$  and length  $l$  has been loaded axially, then ratio of change in diameter to the original diameter is called

- (A) longitudinal strain
- (B) shear strain
- (C) volumetric strain
- (D) lateral strain

18. The bending moment for a certain portion of a beam is constant. For that portion, shear force would be

- (A) zero
- (B) increasing
- (C) decreasing
- (D) constant

19. The area under a stress-strain curve represents

- (A) breaking strength of material
- (B) toughness of material
- (C) hardness of material
- (D) energy required to cause failure

20. The plastic section modulus for a rectangular section of width  $b$  and depth  $d$  is

- (A)  $\frac{bd^3}{3}$
- (B)  $\frac{bd^2}{6}$
- (C)  $\frac{bd^2}{4}$
- (D)  $\frac{bd^2}{12}$

21. A loose uniform sand with rounded grains has effective grain size of 0.05 cm. The coefficient of permeability of the sand is

- (A) 0.25 cm/sec
- (B) 0.50 cm/sec
- (C) 1.00 cm/sec
- (D) 1.25 cm/sec

