

University of Mumbai

Program: CIVIL ENGINEERING

Curriculum Scheme: Rev - 2019

Examination: SE Semester III

Course Code: CE-C304 and Course Name: Architectural Planning and Design of Buildings
Time: 2 hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Fire resistance offered by all structural members of Type II building is _____
Option A:	2 hours
Option B:	3 Hours
Option C:	4 hours
Option D:	1 hour
2.	In wind rose diagram, the concentric circles represent _____
Option A:	Wind direction
Option B:	Wind speed
Option C:	Wind duration
Option D:	Wind Intensity
3.	What is the maximum Pitch for stair case for a public building?
Option A:	40 ⁰
Option B:	45 ⁰
Option C:	35 ⁰
Option D:	33 ⁰
4.	What is the total carpet area of a building if the plot area is 40m x 30m, F.S.I. allowed is 0.9 and ratio of Built-up area to carpet area is 0.8?
Option A:	964 sqm
Option B:	864 sqm
Option C:	1080 sqm
Option D:	1064 sqm
5.	What type of footing will you provide if the column is situated at the boundary of a plot and it is not possible to provide footing exactly below that column?
Option A:	Strip footing
Option B:	Spread footing
Option C:	Strap footing
Option D:	Stepped footing
6.	Which type of roofs is most popular in the coastal south India?
Option A:	Handmade tiles roof
Option B:	Mud-timber flat roof
Option C:	Coconut leaves roof
Option D:	Brick and Lime roof
7.	In perspective view drawing, the point where the eye of the observer is located is

	called_____
Option A:	Station point
Option B:	Vanishing point
Option C:	Centre of vision
Option D:	Line of sight
8.	Line up to which the plinth of a building adjoining a street may be law-fully extended is called
Option A:	Building boundary
Option B:	Building line
Option C:	Building plan
Option D:	Building extend
9.	The IGBC stands for_____
Option A:	International Green Building Council
Option B:	Indian Green Building Centre
Option C:	Indian Green Building Council
Option D:	International Green Building Centre
10.	In AUTOCAD the command ARRAY is used for_____
Option A:	Removing and object
Option B:	Creating multiple copies of objects in a pattern
Option C:	Copying and object
Option D:	Arranging an object in a pattern

Q2	Answer any one of the following questions.	20 marks each
A	<p>Design a RCC G+1 High school building in a district place with following facilities.</p> <p>i) No. of class rooms = 12 nos.(each of 75 sqm area)</p> <p>ii) No. of labs = 3 nos. (60 sqm each)</p> <p>iii) No. of drawing rooms = 3 nos. (60 sqm each)</p> <p>iv) Computer room = 75 sqm</p> <p>v) Principal's office = 60 sqm</p> <p>vi) Office = 75 sqm</p> <p>vii) Library-cum-Reading room = 75 sqm</p> <p>viii)Gymkhana = 100 sqm</p> <p>ix) Canteen = 60 sqm</p> <p>x) Indoor games = 100 sqm</p> <p>(a) Draw line plan of ground floor. (10 marks)</p> <p>(b) Draw line plan of First floor. (10 marks)</p>	

<p style="text-align: center;">B</p>	<p>Plan and design a Primary Health Centre (P. H. C.) in rural area with the following facilities as R.C.C. framed structure as (G+1) storied only. Following are the facilities to be provided on both the floors. Assume floor to floor height as 3.6 m.</p> <p>(i) Entrance and Reception = 30 sq. m. (ii) Doctor's room = 4 no. (Each 20 sq. m.) (iii) Nurse's room = 20 sq. m (iv) Operation theatre = 50 sq. m. (v) General ward = 100 sq. m. (vi) Ladies ward = 75 sq. m. (vii) Store room = 20 sq. m. (viii) Medical store = 30 sq. m. (ix) Changing room = 20 sq. m.</p> <p>Provide toilets, passages, etc. as per the Bye-laws and Regulations. Draw the following with suitable scale.</p> <p>1. Ground Floor developed plan (10 Marks) 2. First floor line plan (10 Marks)</p>
<p style="text-align: center;">Q3</p>	<p>Answer the following questions. (10 marks each)</p>
<p style="text-align: center;">A</p>	<p>Draw a TWO-POINT perspective of a block of 2m steps, 3 in number, having tread and rise as 1 m each. Take eye-level at 0.5 m and station point at 2.5 m</p> <p style="text-align: right;">[10 marks]</p>
<p style="text-align: center;">B</p>	<p>Write the Rules & Procedure in detail for drawing One-Point Perspective drawing for (G+1) storied RCC Residential Structure (10 Marks)</p>
<p style="text-align: center;">Q4</p>	<p>Write SHORT NOTES on any 4 of the following. [5x4 = 20 marks]</p> <p>(1) Roofs (2) Wind rose diagram (3) Master Plan (4) Principle of planning for residential buildings (5) Advantages of AUTO CAD</p>

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	What is the Laplace transform of $\int_0^t \sin 5u \, du$?
Option A:	$\frac{5}{s(s^2 + 25)}$
Option B:	$\frac{5}{s(s^2 - 25)}$
Option C:	$\frac{1}{s(s^2 - 25)}$
Option D:	$\frac{1}{s^2 + 25}$
2.	Find value of b_n in the Fourier expansion of function $f(x) = (2 - x^2)$ in the interval $(0, 2)$.
Option A:	$\frac{2}{n\pi} + \frac{2}{n^3\pi^3}$
Option B:	$\frac{2}{n\pi}$
Option C:	$\frac{4}{n\pi}$
Option D:	$\frac{4}{n^3\pi^3}$
3.	If $f(z) = e^z$ is an analytic function, then real part is given by
Option A:	$e^x \cos y$
Option B:	$\cos y$
Option C:	$-e^x \sin y$
Option D:	$\sin y$
4.	$\mathcal{L}^{-1} [1/(S+2)^4]$
Option A:	$e^{-2t} \cdot t^3 / 3$
Option B:	$e^{-2t} \cdot t^4 / 6$
Option C:	$e^{-3t} \cdot t^3 / 6$
Option D:	$e^{-2t} \cdot t^3 / 6$
5.	If $f(x) = \cos x$ defined in $(-\pi, \pi)$ then the value Fourier coefficient b_n is
Option A:	0
Option B:	π
Option C:	$\frac{\pi}{(n^2 - 1)}$

Option D:	$\frac{2\pi}{(n^2 - 1)} [(-1)^n - 1]$
6.	A function $u(x, y)$ is harmonic if and only if,
Option A:	$u_{xx} + u_{yy} = 0$
Option B:	$u_x + u_y = 0$
Option C:	$u_{xy} + u_{yx} = 0$
Option D:	$u_x - u_y = 0$
7.	Find $L^{-1} \left[\frac{3s + 4}{s^2 + 16} \right]$
Option A:	$4 \sin 4t + \cos 4t$
Option B:	$\cos 4t + \sin 3t$
Option C:	$3 \cos 4t + \sin 4t$
Option D:	$\sin 3t + \cos 4t$
8.	If characteristic equation of matrix A of order 3×3 is $\lambda^3 - 3\lambda^2 + 3\lambda - 1 = 0$. Then by Cayley Hamilton theorem A^{-1} is equal to
Option A:	$A^3 - 3A^2 + 3A - I$
Option B:	$A^2 - 3A - 3I$
Option C:	$3A^2 - 3A - I$
Option D:	$A^2 - 3A + 3I$
9.	The Laplace Transform of $t.e^{at}$
Option A:	$\frac{1}{s}$
Option B:	$\frac{1}{(s-a)^2}$
Option C:	$\frac{1}{(s+a)^2}$
Option D:	$\frac{1}{s^2}$
10.	The equation of one dimensional heat flow is given by
Option A:	$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$
Option B:	$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$
Option C:	$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$
Option D:	$\frac{\partial u}{\partial t} = c^2 \left(\frac{\partial^2 u}{\partial x^2} - \frac{\partial^2 u}{\partial y^2} \right)$

Q2 (20 Marks)	Solve any Four out of Six5 marks each
A	Solve $\frac{\partial^2 u}{\partial x^2} - 2 \frac{\partial u}{\partial t} = 0$ by Bender-Schmidt method, given $u(0, t) = 0$, $u(5, t) = 0$, $u(x, 0) = x^2(25 - x^2)$ Assume $h=1$ & find the values of u up to $t=3$
B	Using convolution theorem find inverse Laplace transform of $\frac{s}{(s^2+1)(s^2+4)}$
C	Find the Laplace transform of $\cos t \cdot \cos 2t \cdot \cos 3t$
D	Using Cayley-Hamilton theorem, find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$.
E	Find k such that $\frac{1}{2} \log(x^2 + y^2) + i \tan^{-1}\left(\frac{kx}{y}\right)$ is analytic.
F	Find Fourier expansion of $f(x) = x^2$ in the interval $(0, 2\pi)$.

Q3 (20 Marks)	Solve any Four out of Six5 marks each
A	Find $L^{-1}\left\{\frac{s-2}{(s^2+4s+8)}\right\}$
B	Find Half Range Cosine Series for $f(x)=x$; $0 < x < 2$
C	Find the orthogonal trajectories of the curve is $e^x \cos y - xy = c$
D	Solve $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$, under the conditions $u(0, t) = 0$; $u(1, t) = t$, $u(x, 0) = 0$ $h = \frac{1}{4}$ (one -time step) using Crank Nicholson's method
E	Show that $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ is diagonalizable. Determine transforming and diagonal matrix.
F	Find L.T. of the following functions:- (i) $te^{-4t} \sin 3t$ (ii) $\frac{1}{t} [\cos(2t) - \cos(3t)]$

Q4 (20 Marks)	Solve any Four out of Six5 marks each
A	Evaluate $\int_0^\infty e^t \sin 2t \cos 3t dt$
B	Find Fourier series of $f(x) = x^2$ in the interval $(-\pi, \pi)$. Hence prove that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$
C	An elastic string stretched between the fixed points $(0, 0)$ and $(1, 0)$ initially in the position $y = A \sin(\pi x)$ and released from rest. Find the displacement $y(x, t)$
D	If $A = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$ Calculate e^A and 5^A
E	Find an analytic function $f(z)$ whose imaginary part is

	$e^{-x}(y \sin y + x \cos y)$
F	Find the inverse Laplace transform of $F(s) = \log\left(\frac{s^2 + a^2}{\sqrt{s+b}}\right)$.

University of Mumbai
Examination: First Half 2022 (May-June 2022)

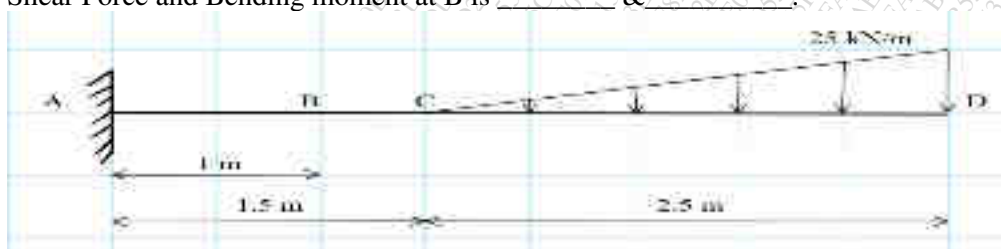
Program: **Civil Engineering**
 Curriculum Scheme: **R2019 (C Scheme)**
 Examination: **SE** Semester: **III**

Course Code: **CEC302**

Course Name: **Mechanics of Solids**

Time: **2 Hour 30 Minutes**

Max. Marks: **80**

Q1.	Choose the correct option for the following questions. All the Questions are compulsory and carry 2 marks each.
1.	A thin cylinder of inner radius 0.5 m and thickness 15 mm is subjected to an internal pressure of 1.5 MPa. The average circumferential (hoop) stress in MPa is
Option A:	25
Option B:	50
Option C:	100
Option D:	200
2.	Shear Force and Bending moment at B is _____ & _____ 
Option A:	31.25 kN & 67.71 kN.m (Hogging)
Option B:	31.25 kN & 67.71 kN.m (Sagging)
Option C:	21.25 kN & 67.71 kN.m (Hogging)
Option D:	21.25 kN & 67.71 kN.m (Sagging)
3.	Elongation of steel rod is if length and c/s of rod is 900 mm and 600 mm ² respectively, subjected to an axial pull of 40 kN. Take E= 200 GPa.
Option A:	0.1 mm
Option B:	0.2 mm
Option C:	0.3 mm
Option D:	0.4 mm
4.	Moment of Inertia about the bottom of a triangle with base B and height H is _____
Option A:	BH ³ /36
Option B:	BH ³ /12
Option C:	BH ³ /48
Option D:	BH ³ /24
5.	Maximum shear stress developed on the surface of a solid circular shaft under pure torsion is 240 MPa. If the shaft diameter is doubled then the maximum shear stress developed corresponding to the same torque will be
Option A:	120 MPa
Option B:	60 MPa
Option C:	30 MPa
Option D:	15 MPa
6.	For a circular shaft of diameter d subjected to torque T, the maximum value of the shear stress is
Option A:	(64T) / (πd ³)
Option B:	(32T) / (πd ³)
Option C:	(16T) / (πd ³)
Option D:	(8T) / (πd ³)

7.	A simply supported beam of span (L) m is subjected to a point load (W) kN at the center. Maximum deflection in beam is _____ m.
Option A:	$\frac{5WL^4}{384 EI}$
Option B:	$\frac{WL^3}{48 EI}$
Option C:	$\frac{5WL^4}{348 EI}$
Option D:	$\frac{WL^3}{84 EI}$
8.	A simply supported beam of span length 6 m and 75 mm diameter carries a uniformly distributed load of 2 kN/m. The maximum bending stress is
Option A:	72.43 MPa
Option B:	217.30 MPa
Option C:	325.15 MPa
Option D:	651.90 MPa
9.	A rectangular beam 100 mm wide and 250 mm deep is subjected to a shear force of 50 kN. What will be the maximum shear stress at the neutral axis?
Option A:	1.5 MPa
Option B:	3 MPa
Option C:	4.5 MPa
Option D:	6 MPa
10.	A solid round bar of 3 m long and of 50 mm diameter is used as a column with both ends hinged. Crippling load by Eulers is _____, If $E = 2 \times 10^5$ MPa
Option A:	67.29 kN
Option B:	57.29 kN
Option C:	62.29 kN
Option D:	70.29 kN

Q2.	Solve any 4 out of 6	5 marks each
A	With usual notations, establish the relation between E, G, K and μ .	
B	A thin cylindrical shell 3.2 m long is having 1.2 m internal diameter and it is 15 mm thick. Calculate hoop stress, longitudinal stress and maximum shear stress if internal fluid pressure is 1.6 MPa.	
C	Draw SFD and BMD for a simply supported beam AB of span "L" m carrying a triangular load of zero intensity at the support A and (W) kN/m at the support B.	
D	Define core or kernel of the section. Locate core of the solid rectangular section having width of 300 mm and depth of 400 mm.	
E	A steel rod of 16 mm diameter and 5 m long is connected to two grips, one at each end at a temperature of 120°C . Find the pull exerted when the temperature falls to 40°C . i. If the ends do not yield. ii. If the ends yield by 1 mm Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $\alpha = 12 \times 10^{-6} / ^{\circ}\text{C}$.	
F	An unknown weight falls through 15 mm on a collar rigidly attached to the lower end of the bar 4 m long and 800 mm^2 in area. If the maximum instantaneous elongation is 3 mm, find the corresponding stress and the value of unknown weight. Take $E = 2 \times 10^5 \text{ N/mm}^2$	

Q3	Solve any 2 Questions out of 3	10 marks each
A	In an experiment, a bar of 40 mm diameter and 200 mm in length is subjected to a pull of 70 kN. Change in length and diameter is 0.09 mm and 0.0039 mm respectively. Calculate the Poisson's ratio, Modulus of Elasticity, Shear Modulus and Bulk Modulus.	

B Draw AFD, SFD and BMD for the frame shown below.

C Figure shows symmetrical inverted I cross section of a beam subjected to shear force of 150 kN. Draw shear stress distribution diagram across the c/s.

Q4 Solve any 2 Questions out of 3 10 marks each

A A hollow circular steel shaft of 6 m length has to transmit 180 kW power at 150 rpm. If internal diameter is 0.6 times external diameter, total angle of twist is not to exceed 4° and shear stress is limited to 50 N/mm^2 , determine diameter of the shaft. Take $G = 84 \text{ kN/mm}^2$.

B A beam of 6 m span is loaded with a UDL of 15 kN/m . The given fig. is symmetrical about Y-Y axis. Determine and draw the maximum tensile and compressive bending stresses across the section.

C For the S/S beam shown, calculate slope at supports and maximum deflection by using Macaulay's method. Take EI constant.