CMR **CMR COLLEGE OF ENGINEERING & TECHNOLOGY**
(UGC AUTONOMOUS)

Examination	:	B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name	:	Strength of Materials-II
Course Code	:	A401307
Branch	:	Civil Engineering
Date & Session	:	08-12-2025 FN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   **10x1=10M**

1. Expression for torsional formula.   1 M
2. Write the expression Polar modulus or torsional section modulus.   1 M
3. Expression for Prof: Perrys formula.   1 M
4. Expression for Crippling load of a column.   1 M
5. Explain maximum and minimum stresses in a rectangular column.   1 M
6. Write conditions of stability in retaining wall.   1 M
7. Differentiate between thin and thick cylinders.   1 M
8. Differentiate between Hoops stress and longitudinal stress in cylinders.   1 M
9. Expression for Radius of gyration.   1 M
10. Expression for Maximum bending stress induced in unsymmetrical bending.   1 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). A closely coiled helical spring is to carry a load of 500N. Its mean coil diameter and   10M
diameter of the wire are 12.6cm and 1.2cm. Find the number of coils if the stiffness of
spring is 20N/mm deflection and shear stress is not to exceed 80N/mm^2
(C=0.8*10^5 N/mm^2).

OR

11. B). A solid shaft is subjected to a torque of 1.6 KN-m. Find the necessary diameter of the   10M
shaft, if the allowable shearing stress is 60 N/mm^2. The allowable twist is 1 degree per
every 20 Diameters length of the shaft. Take C= 80 GPa.

12. A). Determine the maximum stress induced in a horizontal strut of length 3m with a   10M
rectangular cross – section 40 mm wide and 80 mm deep when it carries an axial thrust of
150 kN and a vertical load of 6 kN/m length. The strut has pin joints at its ends.
Take E = 208 GN/m^2.

OR

12. B). A column with a length of 3 m and hinged at both ends has a cross-section of   10M
120 mm×80 mm Find the critical load using Euler's formula. Assume E=2×10^5 N/mm^2.

13. A). A masonry dam of rectangular section, 20 m high and 10 m wide, has water upto a height   10M
of 16 m on its one side. Find
(i)   Pressure force due to water on 1 m length of the dam,
(ii)   Position of centre of pressure
Take the weight density of masonry as 19.62 kN/m^3 and of water as 9.81 kN/m^3.

(P.T.O..)

OR

13. B). What are the conditions to check the stability of the dam against?   10M
(i) Overturning   (ii) Compressive stresses at the base of the dam.

14. A). A cylindrical thin drum 800 mm in diameter and 4m long is made of 10 mm thick. If the   10M
drum is subjected to an internal pressure of 2.5 MPa, determine its change in diameter and
length. Take E as 200 GPa, Poisson's ratio as 0.25.

OR

14. B). A thick cylinder of internal diameter 1500mm and its wall thickness is 60mm. What is the   10M
internal pressure permitted if the maximum hoop stress is not to exceed 80 N/mm^2?

15. A). An equal angle section of 90X90X10 mm is used as a simply supported beam over a span   10M
of 2.5 m. It carries a load of 450 N along the line YG, where G is the centroid of the
section. Calculate the deflection of the beam at the mid-section and its direction with the
load line.

OR

15. B). Determine the stresses and deflection for the mid-section of the L beam by unsymmetrical   10M
method. Also determine the position of the neutral axis.

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Examination : B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name : Hydraulics and Hydraulics Machinery
Course Code : A401308
Branch : Civil Engineering
Date & Session : 09-12-2025 FN 　　　Duration: 3 hours 　　　Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark. 　　　　　　10x1=10M

1.	What are the different types of flow in open channels?	1 M
2.	Define specific energy.	1 M
3.	Define Rapidly Varied Flow.	1 M
4.	What is a hydraulic jump?	1 M
5.	What is the Buckingham π theorem?	1 M
6.	Name the principle of dimensional homogeneity.	1 M
7.	What is a hydraulic turbine?	1 M
8.	What is the function of a draft tube?	1 M
9.	Define pump efficiency.	1 M
10.	What is specific speed of a centrifugal pump?	1 M

PART-B
Answer the following. Each question carries TEN Marks. 　　　5x10=50M

11.A). Define specific energy. Explain the characteristics of specific energy curve with neat sketch. 　　10M

OR

11. B). An open channel of most economical section having the form of a half hexagon with horizontal bottom is required to give a maximum discharge of 20.2m³/s of water. The slope of the channel bottom is 1 in 2500. Take C = 60, find the dimensions of the cross section. 　　10M

12. A). Explain in detail about the classification and its characteristics of Gradually varied flow profiles with help of neat sketches. 　　10M

OR

12. B). A sluice spans a channel of rectangular section 15 metres wide and has an opening 0.60 metre wide and discharges 40 cumecs of water. If a hydraulic jump is formed on the downstream side of the sluice, determine the probable height of the crest above the upper edge of the sluice. Find also the loss of energy head due to the jump formed. 　　10M

13. A). Explain in detail about Buckingham's pi theorem of dimensional analysis. Give one example. 　　10M

OR

13. B). Derive an expression for the force exerted by a jet of water on an inclined fixed plate in the direction of the jet. 　　10M

(P.T.O..)

14. A). Illustrate the classification of turbines. 10M

<center>**OR**</center>

14. B). i) Define specific speed of a turbine and derive the expression for the same. 5M

ii) A turbine operates under a head of 40m at 400rpm. The discharge is 15m3/sec. if the 5M overall efficiency is 90%. determine the specific speed, power generated and type of turbine.

15. A). What are characteristic curves in general. Also explain them with reference to centrifugal 10M pumps.

<center>**OR**</center>

15. B). i) Discuss the concept of multistage pumps in detail. 5M

ii) A centrifugal pump has three stages discharging 120 lit/s, working against a head of 5M 45 m, running at 1400 rpm. Determine the specific speed of the pump.

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Examination	:	B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name	:	Concrete Technology
Course Code	:	A401306
Branch	:	Civil Engineering
Date & Session	:	10-12-2025 FN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	List the different sieve sizes for sieve analysis of aggregates.	1 M
2.	Differentiate M sand and River sand.	1 M
3.	Define workability of concrete.	1 M
4.	Define segregation	1 M
5.	Define Gel/space ratio.	1 M
6.	Define Abram's Law.	1 M
7.	List Different types of shrinkage.	1 M
8.	Define Poisson's ratio.	1 M
9.	What is significance of target mean strength?	1 M
10.	What is aspect ratio in fibre reinforced concrete?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	List out various characteristics of good aggregates and explain about any 3 in detail.	10M
	OR	
11. B).	Describe the mechanical properties of aggregates that are important for construction	10M
12. A).	Explain briefly about the steps involved in manufacturing of concrete.	10M
	OR	
12. B).	Explain the laboratory procedure for determination of workability of concrete by using Vee-Bee consistometer test with neat diagram	10M
13. A).	Explain the effect of Gel-Space ratio on strength of hardened concrete.	10M
	OR	
13. B).	Describe the ultrasonic pulse velocity test with the help of neat sketch.	10M
14. A).	What is creep of concrete and factors affecting creep of concrete?	10M
	OR	
14. B).	Briefly explain relation between creep and time and also explain dynamic modulus of elasticity?	10M
15. A).	Design a concrete mix for characteristic strength of 35MPa at 28 days with a standard deviation of 4MPa. The specific gravity of FA and CA are 2.65 and 2.75 respectively. A slump of 50mm is necessary. The specific gravity of cement is 3.15. Assuming the necessary data, design the mix as per IS code method.	10M
	OR	
15. B).	Describe high density concrete and fibre reinforced concrete.	10M

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Examination	:	B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name	:	Structural Analysis-I
Course Code	:	A401309
Branch	:	Civil Engineering
Date & Session	:	19-12-2025 FN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   **10x1=10M**

1. Write the formula to determine if a pin-jointed frame is perfect.   1 M
2. Which truss configuration is inherently stable?   1 M
3. What is strain energy?   1 M
4. Where does the maximum bending moment in a three-hinged arch occurs?   1 M
5. Define propped cantilever.   1 M
6. Write the main advantage of a fixed beam over simply supported beam.   1 M
7. Which type of support is encountered in continuous beams?   1 M
8. Write the general slope-deflection equation.   1 M
9. State one main use of the influence line diagram.   1 M
10. Define influence line diagram.   1 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). Find the forces in the members of a truss as shown in Figure.1 by method of Joints.   10M
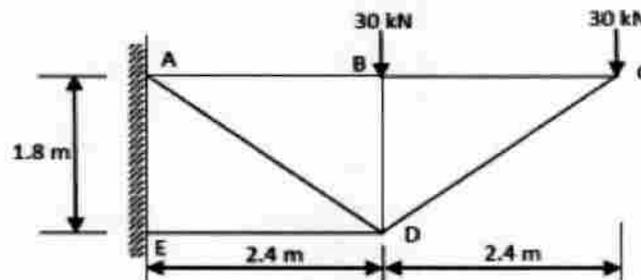

Figure.1

OR

11. B). Determine the forces in all the members of the truss shown in Figure.2 by method of Sections.   10M
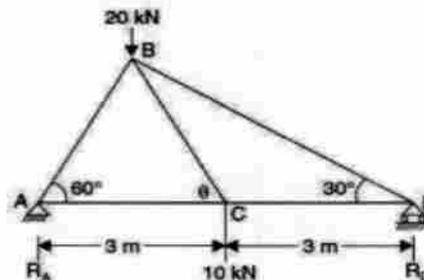

Figure.2

(P.T.O..)

12. A). Define Castigliano's theorem-1 and also derive an expression for strain energy due to bending.   10M

OR

12. B). A symmetrical three hinged arch has a span of 40 & rise 8m carries a uniformly distributed load of 30kN/m over the left half of the span. The hinges are provided at the supports and at the centre of the arch. Calculate the reaction at the supports. Also calculate the bending moment, radial shear and normal thrust at a distance of 10m from the left support.   10M

13. A). Analyse the propped cantilever beam loaded as shown in the Figure.3. Draw the S.F.D and B.M.D. Assume EI constant throughout.   10M
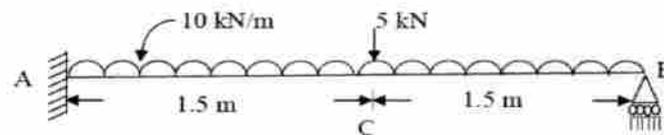

Figure.3

OR

13. B). A fixed beam of span 6 m is subjected a UDL of 5 kN/m on the left half of the span and a point load of 15 kN at the middle of the right half of the span. Draw the S.F. and B.M. diagrams.   10N

14. A). A continuous beam ABC consists of two spans AB of length 4m, and BC of length 3m. The span AB carries a point load of 100 KN at its middle points. The span BC carries a point load of 120 KN at 1m from C. The end A is fixed and the end C is simply supported. Find The moments at the supports The reactions at the supports and Draw the B.M diagram. Use Clapeyron's theorem of three moments.   10M

OR

14. B). Analyse the two-span continuous beam loaded as shown in Figure.4, by slope-deflection method, if the moment of inertia is span AB is I and that of span BC is 3I. Sketch the B.M and SFD.   10M
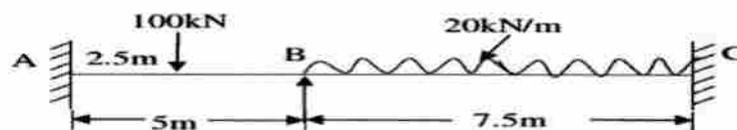
Figure.4

15. A). An uniformly distributed load of 40 kN/m and of length 3m transverse across the span of simply supported length of 18 m. Compute the maximum bending moment at 4m from the left support and absolute bending moment.   10M

OR

15. B). Five-wheel loads 10kN, 20kN,15kN,16kN and 24kN spaced at 1m intervals roll on a girder of span 20m from left to right with the 10kN load leading. Find the absolute maximum bending moment on the girder using influence lines.   10M

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Examination	:	B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name	:	Probability & Statistics
Course Code	:	A400005
Branch	:	Civil Engineering
Date & Session	:	06-12-2025 FN

Duration: 3 hours   Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1. A class consists of 6 girls and 10 boys. If a committee of 3 is chosen at random from the class, find the probability that 3 boys are selected   1 M

2. State the conditional probability formula for two events and also write product rule.   1 M

3. Define Chebyshev's Theorem.   1 M

4. Write mean of binominal distribution.   1 M

5. For a t-distribution find $t_{0.05}$ when $v = 16$ 1 M

6. Derive mean of Uniform distribution   1 M

7. In a random sample of 400 industrial accidents, it was found that 231 were due to unsafe working conditions. Find the maximum error.   1 M

8. Define (i) Type I error (ii) Type II error   1 M

9. Write normal equations to fit straight line of the type $y = a + bx$ 1 M

10. Interpret the value of correlation coefficient r_{xy} as 1, -1, 0   1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Given the following table: 10M

X	-3	-2	-1	0	1	2	3
P(x)	0.05	0.10	0.30	0	0.30	0.15	0.10

Compute (i)$E(X)$ (ii)$E(2X \pm 3)$ (iii)$E(4X + 5)$ (iv)$E(X^2)$ (v)$V(X)$ (vi)$V(2X \pm 3)$

OR

11. B). First box contains 2 black, 3 red, 1 white balls; second box contains 1 black, 1 red, 2 white balls and third box contains 5 black, 3 red, 4 white balls. Of these a box is selected at random. From it a red ball is randomly drawn. If the ball is red, find the probability that it is from   10M

    (i)   First box.

    (ii)   Second box.

    (iii)   Third box only

(P.T.O..)

12. A). The distribution of typing mistakes committed by a typist is given below. Assuming the distribution to be Poisson, find the expected frequencies.   10M

Number of mistakes per page, x	0	1	2	3	4	5
Number of pages, $f(x)$	42	33	14	6	4	1

OR

12. B). Out of 800 families of 5 children each, how many would you expect to have i) 3 boys ii) 5 girls iii) either 2 or 3 boys iv) at least 1 boy. Assume equal probability for boys and girls.   10M

13. A). In a Normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of distribution.   10M

OR

13. B). A random sample of size 100 is taken from an infinite population having the mean 76 and variance 256. What is the probability that $\bar{x}$ will be between 75 and 78.   10M

14. A). A study shows that 16 of 200 tractors produced on one assembly line required extensive adjustments before they could be slipped. While the same was true for 14 of 400 tractors produced on another assembly line. At 1% l.o.s, does this support the claim that the second production line does the superior work? Also calculate 99% confidence interval for the population proportion.   10M

OR

14. B). A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population.   10M

15. A). Fit a second degree parabola for the following data.   10M

X	40	30	40	19	21	35	78	65
y	34	28	27	36	35	15	28	26

OR

15. B). From the following data calculate the rank correlation coefficient after making adjustment for tied ranks. Also comment on the result.   10M

A	48	33	40	9	16	16	65	24	16	57	60
B	13	13	24	6	15	4	20	9	16	19	22

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