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BCV301

Third Semester B.E./B.Tech. Degree Examination, June/July 2025 Strength of Materials

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks, L: Bloom's level, C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define the following : i) Stress ii) Poisson's Ratio iii) Volumetric strain iv) Bulk Modulus	06	L1	CO1
	b.	Derive the relation between modulus of rigidity and Young's modulus of elasticity.	06	L3	CO1
	c.	Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 25 mm and of length 1.2 m, if the longitudinal strain in the bar during a tensile test is four times the lateral strain. Also find the change in volume when the bar is subjected to a hydrostatic pressure of 120 N/mm^2 . Take $E = 1.2 \times 10^5 \text{ MPa}$.	08	L3	CO1
OR					
Q.2	a.	Derive an expression for the deformation of a rectangular tapering bar of uniform thickness subjected to an uniaxial load 'P'.	06	L3	CO1
	b.	Draw stress – strain diagram for structural steel subjected to axial tensile force and explain the salient points.	06	L2	CO1
	c.	A concrete column with square section with side 250 mm is reinforced with Four steel bars of 15 mm diameter (each). Determine the stresses induced in concrete and steel bars, when the column is subjected to a load of 300 kN. Take $E_{\text{steel}} = 200 \text{ GPa}$ and $E_{\text{concrete}} = 14 \text{ GPa}$.	08	L3	CO1
Module – 2					
Q.3	a.	Define i) Shear Force ii) Bending Moment iii) Point of contraflexure	06	L1	CO2
	b.	Derive the relation between rate of loading, shear force and bending moment.	06	L3	CO2
	c.	Draw the shear force diagram and bending moment diagram for a simply supported beam subjected to the loads as shown in fig. Q.3 (c)	08	L4	CO2
		Fig. Q.3 (c)			

OR

Q.4	a.	With help of neat sketches, explain different types of beams and different types of loadings.	06	L2	CO2
	b.	Draw shear force and bending moment diagrams for a cantilever beam subjected to uniformly distributed load of intensity W kN/m on its entire length.	06	L3	CO2
	c.	Draw the shear force and bending moment diagrams for a cantilever subjected to Forces as shown in fig. Q.4 (c)	08	L4	CO2

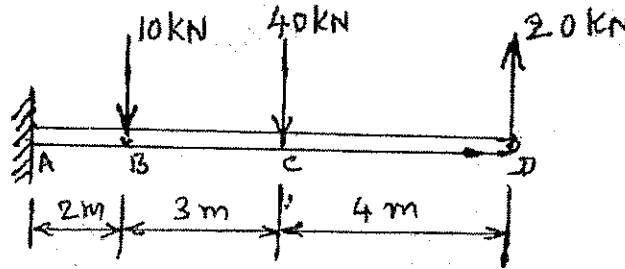


Fig. Q.4 (c)

Module - 3

Q.5	a.	Define i) neutral axis ii) Section Modulus iii) Moment of resistance.	06	L1	CO3
	b.	Derive the simple bending equation in the form $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$ with usual notations.	06	L3	CO3
	c.	A beam is simply supported and carries a uniformly distributed load of 40 kN/m over the entire span. The section of the beam is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is $7 \times 10^8 mm^4$, find the span of the beam.	08	L3	CO3

OR

Q.6	a.	List the assumptions made in the theory of pure torsion.	06	L1	CO3
	b.	With usual notations derive the torsion equation $\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{L}$	06	L3	CO3
	c.	A solid shaft rotating at 500 rpm transmits 30 kw. Maximum torque is 20% more than the mean torque. Material of shaft has the allowable shear stress 65 MPa and modulus of rigidity 81 GPa . Angle of twist in the shaft should not exceed 1° in 1 meter length. Determine the diameter of shaft.	08	L3	CO3

Module - 4

Q.7	a.	Define i) slope ii) deflection iii) Elastic curve	06	L1	CO4
	b.	Derive the deflection equation $EI \frac{d^2y}{dx^2} = M$	06	L3	CO4
	c.	Derive expressions for maximum slope and deflection in a simply supported beam subjected to point load 'w' at mid point.	08	L3	CO4

OR

Q.8	a.	Define i) slenderness ratio ii) long column iii) short column	06	L1	CO4
	b.	Using Euler's theory, derive an equation for the crippling load of a long column pinned at both ends.	06	L3	CO4
	c.	A hollow circular column is used to carry an automobile of weight 20 KN. Length of the column is 3 meters. Material of column has an yield stress of 330 MPa. Outer diameter of the column is 100 mm and thickness of wall is 5 mm. one end of the column is fixed and other end is free. Taking $E = 200\text{GPa}$, determine : i) Factor of safety ii) Ratio of yield stress to crippling stress.	08	L3	CO4

Module – 5

Q.9	a.	Define i) Principal stresses ii) Principal planes	06	L1	CO5
	b.	An uniform bar is subjected to axial tensile stress of 100 N/mm^2 . Determine i) Stress acting on a plane which is at an angle of 60° with reference to 100 N/mm^2 stress plane ii) Magnitudes of maximum and minimum stresses induced and position of their planes iii) Magnitude of normal stress on the plane of maximum shear stress.	06	L3	CO5
	c.	A point in a machine member is subjected to principal stresses of magnitudes 30 MPa in tension and 100 MPa in compression. Determine i) Stresses acting on an element whose normal to one of its faces is oriented at an angle of 120° with reference to x – axis ii) Maximum and minimum shear stresses and their orientations. iii) Normal stresses acting on maximum and minimum shear stress planes.	08	L3	CO5

OR

Q.10	a.	Define : i) Thin cylinder ii) Thick cylinder iii) Hoop stress	06	L1	CO5
	b.	Derive Lamé's equation for the radial and hoop stresses for thick cylinder subjected to internal and external fluid pressure.	06	L3	CO5
	c.	A thick walled cylindrical pressure vessel has inner radius of 150 mm and outer radius of 185 mm. Draw a sketch showing the radial pressure and hoop stress distribution in the section of the cylinder wall, when an internal pressure of 10 MPa is applied.	08	L3	CO5

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BCV302

Third Semester B.E./B.Tech. Degree Examination, June/July 2025 Engineering Survey

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Briefly explain classification of survey based on object of survey.	8	L1	CO1
	b.	Explain briefly plane table survey and cadastral survey.	8	L2	CO1
	c.	Explain briefly concept of electronic distance measurement.	4	L1	CO1
OR					
Q.2	a.	What is surveying? Briefly explain classification of survey based on nature survey.	8	L2	CO1
	b.	Explain topographical survey and cadastral survey.	8	L2	CO1
	c.	Explain various types of tapes.	4	L1	CO1
Module – 2					
Q.3	a.	Explain the measurement of horizontal angle by repetition method with necessary standard tabular format.	8	L2	CO2
	b.	In running fly levels from a benchmark of RL 384.705, the following readings were obtained : Back sight : 3.215, 1.030, 1.295 and 1.885 Fore sight : 1.225, 3.290, 2.085 From the last position of the instrument six pegs at 25 m intervals are to be set out on a uniformly falling of 1 in 100, the first peg is to bare RL of 384.500. Work out the staff readings required for setting the tops of the pegs on the given gradient.	12	L3	CO2
OR					
Q.4	a.	Explain the following Bench Mark mean sea level, datum, elevation.	8	L2	CO2
	b.	The following consecutive reading were taken with a level and 3 metre leveling staff on a continuously sloping ground at a common interval of 20 meter 0.602, 1.234, 1.860, 2.574, 0.238, 0.914 1.936, 2.872, 0.568, 1.824, 2.722 RL of first point was 192.122. Rule out page of a level field book and enter the above reading. Calculate the reduced levels of the points and also the gradient of the line joining the first and the last point?	12	L3	CO2
Module – 3					
Q.5	a.	Explain user of contour map.	4	L1	CO3
	b.	Explain characteristics of contours.	8	L2	CO3
	c.	What do you mean by contour? Explain the factors governing the choice of proper contour interval.	8	L2	CO3
OR					
Q.6	a.	Explain the following station, turning point, fore sight and back sight.	8	L2	CO3
	b.	Explain the procedure for measurements of coordinator using total station.	8	L2	CO3
	c.	With a neat sketch explain profile leveling.	4	L2	CO3

Module – 4

Q.7	a.	A railway embankment is 10 m wide with side slope 1.5 to 1. Assuming the ground to be level in a direction transverse to the centre line, calculate the volume by prismoidal and trapezoidal formula contained in length of 120 m, the centre heights at 20 m intervals being in meters 2.2, 3.7, 3.8, 4.0, 3.8, 2.8, 2.5	10	L3	CO4
	b.	The following perpendicular offsets were taken from a chain line to a curved boundary line at intervals of 15 m in the following order : 0, 2.65, 3.80, 3.75, 4.65, 3.60, 4.95, 5.85 m Compute the area between the chain, the curved boundary and the end offsets by trapezoid and Simpson's rule.	10	L3	CO4

OR

Q.8	a.	With a neat sketch derive an expression for simple curve by Rankine's method.	10	L2	CO4
	b.	Two tangents intersect at a chainage of 1190 m, the deflection angle 36° . Compute all the data necessary to set out a curve of radius 300 m by deflection angle method. The peg interval is 30 m. Tabulate the results.	10	L3	CO4

Module – 5

Q.9	a.	Explain sources of errors in GPS.	10	L2	CO5
	b.	Explain any two applications and uses of remote sensing and GIS in civil engineering surveying.	10	L2	CO5

OR

Q.10	a.	Explain application and advantages of Drone in surveying.	10	L2	CO5
	b.	Explain Drone surveying requirements.	10	L2	CO5

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BCV304

Third Semester B.E/B.Tech. Degree Examination, June/July 2025 Water Supply and Waste Water Engineering

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level, C: Course outcomes.
3. Missing data, if any, may be suitably assumed.

		Module – 1	M	L	C												
1	a.	What is meant by per capita demand? What are the different types of water demand? Explain any two water demand in detail.	6	L2	CO1												
	b.	The population data for a certain town is given below. Find out the population in the year 2011 and 2021 by incremental increase method.	10	L3	CO1												
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Year</th> <th style="text-align: center;">1961</th> <th style="text-align: center;">1971</th> <th style="text-align: center;">1981</th> <th style="text-align: center;">1991</th> <th style="text-align: center;">2001</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Population</td> <td style="text-align: center;">75,000</td> <td style="text-align: center;">1,10,000</td> <td style="text-align: center;">1,50,000</td> <td style="text-align: center;">2,00,000</td> <td style="text-align: center;">2,42,000</td> </tr> </tbody> </table>	Year	1961	1971	1981	1991	2001	Population	75,000	1,10,000	1,50,000	2,00,000	2,42,000			
Year	1961	1971	1981	1991	2001												
Population	75,000	1,10,000	1,50,000	2,00,000	2,42,000												
	c.	Write drinking water standards along with the units for the following parameters : i) pH ii) Turbidity iii) Chloride iv) Iron.	4	L2	CO1												
OR																	
2	a.	What is design period? Briefly explain any four factors governing design period.	6	L2	CO1												
	b.	In two periods of each of 20 years, a city has grown from 30,000 to 1,70,000 and then to 3,00,000. Determine : i) The saturation population ii) The equation of the logistic curve iii) The expected population after next 20 years.	10	L3	CO1												
	c.	List the physical and chemical water quality parameters.	4	L1	CO2												
Module – 2																	
3	a.	What is Aeration? List the different types of aerators and explain any one aerator in detail.	4	L1	CO3												
	b.	The maximum daily demand at a water purification plant has been estimated as 12 million liters per day. Design the dimensions of a suitable sedimentation tank (fitted with mechanical sludge removal arrangements) for the raw supplies, assuming a detention period of 6 hours and the velocity of flow as 20 cm per minute. Assume water depth in the tank as 4 m.	10	L3	CO3												
	c.	How is coagulation carried out with alum? Explain with the help of chemical reaction.	6	L2	CO3												
1 of 3																	

OR

4	a.	With the help of a neat sketch, explain briefly on filter backwashing process of rapid sand filter.	10	L2	CO3
	b.	Design the approximate dimensions of a set of rapid gravity filters for treating water required for a population of 50,000, the rate of supply being 180 liters per day per person. The filters are rated to work 5000 liters per hour per square meter. Assume two units to be designed and maximum demand is 1.8 time the average daily demand. Take length as 1.5 times the breadth.	10	L3	CO3

Module – 3

5	a.	List minor methods of disinfection and explain any two methods in detail.	6	L1	CO3
	b.	Describe types of sewerage system with their advantages and disadvantages.	6	L2	CO4
	c.	The BOD of a sewage incubated for one day at 30°C has been found to be 110 mg/l. What will be the 5-day 20°C BOD? Assume $K_1 = 0.1$ at 20°C.	8	L3	CO4

OR

6	a.	With the chemical equations, explain how hardness is reduced from water by lime-soda process.	8	L2	CO3
	b.	The following observations were made on a 3% dilution of wastewater. Dissolved Oxygen (DO) of aerated water used for dilution = 3 mg/l Dissolved Oxygen (DO) of diluted sample after 5 days incubation = 0.8 mg/l Dissolved Oxygen (DO) of original sample = 0.6 mg/l Calculate the BOD of 5 days and ultimate BOD of the sample assuming that the deoxygenating coefficient at test temperature is 0.1.	12	L3	CO4

Module – 4

7	a.	Write the flow diagram employed for municipal wastewater treatment plant. Explain each unit with its importance in flow diagram.	8	L2	CO4
	b.	An average operating data for conventional activated sludge treatment plant is as follows : i) Wastewater flow = 35,000 m ³ /d ii) Volume of aeration tank = 10900 m ³ iii) Influent BOD = 250 mg/l iv) Effluent BOD = 20 mg/l v) Mixed liquor suspended solids (MLSS) = 2500 mg/l vi) Effluent suspended solids = 30 mg/l vii) Waste sludge suspended solids = 9700 mg/l viii) Quantity of waste sludge = 220 m ³ /d Based on the information above, determine : i) Aeration period (hours) ii) Food to microorganism ratio (F/m) (kg BOD per day / kg MLSS) iii) Percentage efficiency of BOD removal iv) Sludge age (days).	12	L3	CO4

OR

8	a.	What do you mean by unit operation and unit process in waste water treatment plant? Give examples.	6	L1	CO4
	b.	Explain the different types of screens.	6	L2	CO4
	c.	With the neat sketch, explain how oil and grease is removed from wastewater.	8	L2	CO4

Module – 5

9	a.	Determine the size of a high rate trickling filter for the following data : Sewage flow = 5 MLD Recirculation ratio = 1.5 BOD of raw sewage = 230 mg/l BOD removal in primary clarifier = 30% Final effluent BOD desired = 25 mg/l Depth of the filter = 1.8 m.	10	L3	CO4
	b.	With the neat sketch, explain the algae bacteria symbiosis in stabilization pond.	6	L2	CO5
	c.	Write a short note on Rotating Biological Contractor (RBC).	4	L1	CO4

OR

10	a.	A single stage filter is to treat a flow of 3.79 MLD of raw sewage with BOD of 240 mg/l. It is to be designed on a loading of 11,086 kg of BOD in raw sewage per hector meter and the recirculation ratio is to be 1. What will be the strength of the effluent, according to the recommendation of the national research council of USA?	10	L3	CO4
	b.	Write a neat sketch, explain the constructional details of sludge digestion tank.	6	L2	CO4
	c.	Write short notes on sludge drying beds.	4	L1	CO5

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BCV306D

Third Semester B.E./B.Tech. Degree Examination, June/July 2025 Fire Safety in Buildings

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module - 1			M	L	C
Q.1	a.	With neat sketch explain the concept of fire triangle.	06	L2	CO1
	b.	Explain the various principles involved in the fire extinguishing.	08	L2	CO1
	c.	With time-temperature curve briefly explain the various stages of fire.	06	L2	CO1
OR					
Q.2	a.	Briefly explain the design consideration for fire safety in concrete and steel structures.	10	L2	CO1
	b.	Briefly explain the effect of fire on the following construction materials: i) Concrete ii) Steel iii) Timber iv) Stone	10	L2	CO1
Module - 2					
Q.3	a.	Briefly explain about various fire suppression systems.	10	L2	CO2
	b.	What is Refuge Area? Mention the rules for Refuge area as per NBC code.	10	L2	CO2
OR					
Q.4	a.	What are the assumption to be made in the lift design?	10	L2	CO2
	b.	Consider a building with 16 floors having population of 1000. The details of lift are given below; Car capacity = 16 Door closing time = 2.5 sec. Door opening time = 1.5 sec. No. of lifts = 05 Single floor flight time = 5 sec. Single floor transit time = 1 sec. Passenger transfer time = 1.2 sec. Calculate : i) Round trip time (RTT) ii) Average number of stops iii) Time consumed when stopping iv) Up peak Interval v) Up peak handling capacity.	10	L3	CO2
Module - 3					
Q.5	a.	What is fixture unit? Mention the essential requirements of plumbing fixtures.	10	L2	CO3
	b.	Enumerate the steps involved in the design of water supply distribution system.	10	L2	CO3
1 of 2					

OR

Q.6	Find the pipe size required to provide water supply for a 4 storey (G + 4) building with each storey height of 3m. A water tank is supported over the terrace on columns of height 3m. The fixture in each apartment consists of following: (Elevation of highest fixture = 1.95m)		20	L4	CO4	
	Room	Type of Fixture				Fixture unit value
	Kitchen	Kitchen sink				02
		Kitchen tap				02
	Water closet (W.C) Room	Ablution tap				01
Supply to over head flush tank		01				
Bath Room	Shower	02				
	Tap	02				
	Wash Basin	01				
	Supply to Geyser	02				
Assume loss of head in a 25mm size meter in 4.5m.						

Module – 4

Q.7	a.	Explain the role of maintenance management in overall building construction activity.	10	L2	CO4
	b.	Write short notes on : i) Intelligent Buildings ii) Psychrometric chart	10	L2	CO4

OR

Q.8	a.	Following data are available for air conditioned restaurant: Outside design condition : Dry Bulb Temperature = 41.9°C Wet Bulb Temperature = 27.1°C Inside design condition : Temperature = 26°C Relative Humidity = 50% Size of Restaurant = 20m × 15m × 4m No. of Air changes / hour = 2 Opening and closing of door per hour = 3 Use factor = 3 Air ventilation required / person = 0.48m ³ /person Humidity ratio for outside and inside are 16.6 and 11.1 respectively. Maximum capacity of Restaurant = 100 persons. Calculate: i) Total Infiltration in m ³ /min. ii) Ventilation required in m ³ /min and iii) Total load due to outside air.	12	L3	CO4
	b.	Mention the governing equations with notations for i) Sensible Heating and Cooling ii) Heating and Humidification.	05	L2	CO4
	c.	What is life cycle cost? How it is determined for a building?	03	L2	CO4

Module – 5

Q.9	a.	Enumerate the points to be considered while carrying out diagnosis of building by visual survey.	10	L2	CO5
	b.	Explain the procedure for carrying out the following tests. i) Pulse velocity method ii) Rebound Hammer test	10	L2	CO5

OR

Q.10	a.	Explain the effects of corrosion of steel in concrete.	10	L2	CO5
	b.	Write short note on : i) Carbonation in concrete ii) RCPT Test.	10	L2	CO5