AJ Institute of Engineering and Technology Mangaluru.

VTU Question Papers

CIVIL ENGINEERING

Supplementary Exam

III to VIII Semester

2022 SCHEME

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AJ Institute of Engineering and Technology, Mangaluru.

NH-66, Kottara Chowki, Mangaluru – 575 006

INDEX

CBCS SCHEME

USN | | | | | | | | | | |

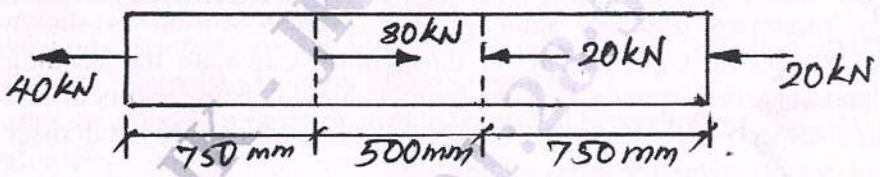
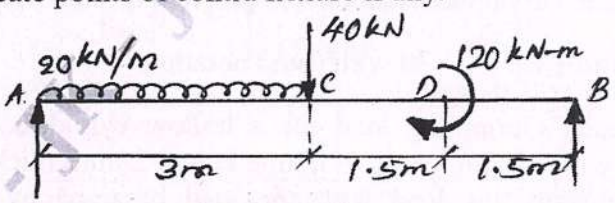
BCV301

Third Semester B.E./B.Tech Degree Supplementary Examination, June/July 2024

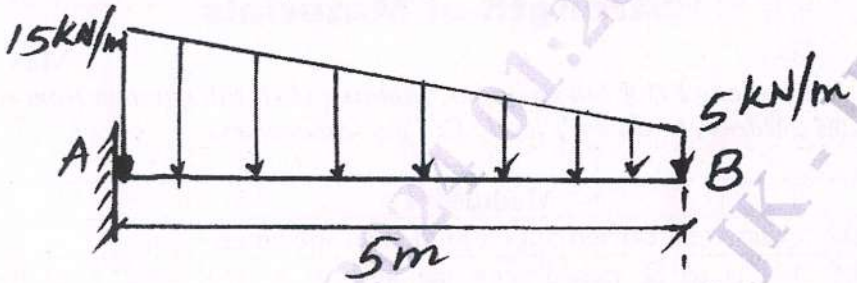
Strength of Materials

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.	Explain the tension test carried out on mild steel specimen.	5	L2	CO1
	b.	A load of 5kN is to be raised with the help of a steel wire. Find the minimum diameter of the wire if the stress in the wire is not to exceed 100MPa. The length of the wire is 2m. Take E = 210×10^3N/mm^2. Also determine the elongation due to the load.	5	L3	CO1
	c.	A load of 2MN is applied on a column 500mm × 500mm. The column is reinforced with four steel bars of 10mm diameter placed in corners. Find the stress in concrete and steel bars. Take E for steel as 2×10^5N/mm^2 and for concrete as 1.4×10^4N/mm^2.	10	L3	CO1
		OR			
Q.2	a.	Define the four elastic constants.	4	L2	CO1
	b.	A steel rod has a diameter of 100mm and overall length of 2m. It is subjected to direct axial forces at different sections as shown in Fig.Q2(b). If E for steel is 210×10^3N/mm^2, determine the total deformation.  Fig.Q2(b)	6	L3	CO1
	c.	A bar tapers uniformly form a diameter of 60mm at one end to 40mm at the other end over a length of 1.5m. The bar is subjected to an axial load of 100kN. If E for bar material is 2×10^5N/mm^2. Derive the formula for elongation of tapered circular bar and obtain the elongation of the given bar.	10	L3	CO1
		Module – 2			
Q.3	a.	Define : i) Shear force ii) Bending moment iii) Point of contra flexure.	5	L2	CO2
	b.	Draw the SFD and BMD for the simply supported beam loaded as shown in Fig.Q3(b). Locate points of contra flexure if any.  Fig.Q3(b)	10	L3	CO2
	c.	Derive the relationship between load intensity (w), shear force (f) and bending moment (M) in a loaded beam.	5	L3	CO2

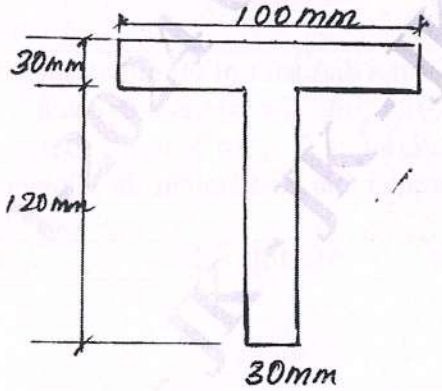
OR

Q.4	**a.**	A beam ABCD, 8m long has supports at 'a' and at 'C' which is 6m from 'A'. The beam carries a udl of 10kN/m between A and C. At point 'B' a 30kN concentrated load 2m from support A and a point load 15kN acts at the free end 'D'. Draw the SFD and BMD giving salient values and locate points of contra flexure if any.	**14**	**L3**	**CO2**
	b.	Plot the SFD and BMD for the cantilever beam shown in Fig.Q4(b).  Fig.Q4(b)	**6**	**L3**	**CO2**

Module – 3

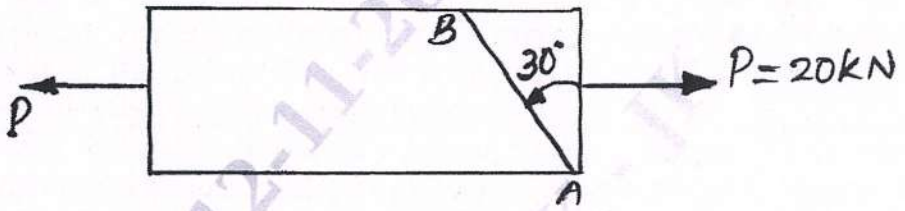
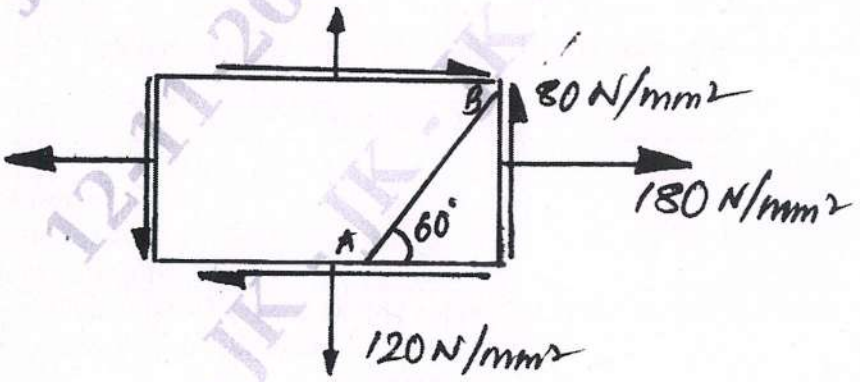
Q.5	**a.**	Derive the expression $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$ with usual notations.	**10**	**L3**	**CO3**
	b.	A hollow circular shaft rotates at a speed of 120rpm transmitting 500kN. The internal diameter of the shaft is 0.75 times its external diameter. Find the dimensions of the shaft if the shear stress is limited to 80N/mm^2 and angle of twists limited to 1° in a length of 2m. Assume maximum torque to be greater than mean torque by 20%. Take G = 85GPa.	**10**	**L3**	**CO3**

OR

Q.6	**a.**	Derive the torsion expression $\frac{T}{I_{22}} = \frac{q_s}{R} = \frac{C.\theta}{\ell}$ with usual notations.	**6**	**L3**	**CO3**
	b.	A simply supported beam of span 6m has a cross section as shown Fig.Q6(b). It carries a udl of 5kN/m throughout. Calculate the bending stresses and shearing stresses for maximum values of being moment and shear force respectively. Draw neat diagrams of bending stress and shear stress distribution across the cross section.  Fig.Q6(b)	**14**	**L3**	**CO3**

Module – 4

Q.7	**a.**	Derive the moment curvature equation or differential equation for beam deflection in the form $EI\frac{d^2y}{dx^2} = M$ with usual notation.	**8**	**L3**	**CO4**
	b.	Determine the Euler's crippling load for a hollow cylindrical cast iron column 6m long with 150mm external diameter and 20mm thick with both ends hinged. Compare this load with the load obtained by Rankine's formula. Use the constants f_c = 550MPa, $\alpha = \frac{1}{1600}$, E = 80GPa.	**12**	**L3**	**CO4**

		OR			
Q.8	**a.**	Derive the Euler's crippling load for a column with both ends hinged.	**6**	**L3**	**CO4**
	b.	A beam of uniform section is 10m long. It is simply supported at its ends. It carries loads of 100kN and 80kN at distances of 2m and 6m respectively from the left end. Calculate the deflections under each load and slope at left support. Take $E = 2 \times 10^5$ N/mm^2 and $I = 8.5 \times 10^7$mm^4.	**14**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Define : i) Principal planes ii) Principal stresses.	**4**	**L3**	**CO4**
	b.	A circular bar of 25mm diameter is subjected to an axial force of 20kN as shown in Fig.Q9(b). Determine the normal and tangential stresses on an inclined plane AB shown.  Fig.Q9(b)	**6**	**L3**	**CO5**
	c.	A thin cylinder of 250mm internal diameter with 4mm metal thickness and length 750mm is storing a fluid under a pressure fo 3N/mm^2. Calculate the hoop or circumferential stress and longitudinal stress developed in the wall of the cylinder. If Young's modulus for the material is 210GPa and Poisson's ratio is 0.286, calculate change in diameter, length and volume of cylinder.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Derive Lame's equations for hoop and radial stresses for thick cylinder subjected to internal and external fluid pressure.	**8**	**L3**	**CO5**
	b.	The state of stress at a point in strained material is as shown in Fig.Q10(b). Determine : i) Principal stresses and their planes ii) Maximum shear stress and its planes. Sketch the planes you have determined.  Fig.Q10(b) Also determine the normal and tangential stresses acting on the inclined plane AB shown.	**12**	**L3**	**CO5**

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CBCS SCHEME

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BCV302

Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

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.	Define surveying. Mention the objectives and importance of surveying.	5	L2	CO1
	b.	Write a short notes on : (i) Electronic distance measurement (ii) Distance measuring wheel.	10	L2	CO1
	c.	Differentiate between Prismatic and Surveyor compass.	5	L2	CO1
		OR			
Q.2	a.	Define : (i) Hydrographic Survey (ii) Underground Survey (iii) Control Survey (iv) Cadastral Survey	8	L2	CO1
	b.	Explain briefly about advantages and disadvantages of plane table surveying.	6	L2	CO1
	c.	Explain briefly the various types of tapes.	6	L2	CO1
		Module – 2			
Q.3	a.	The following staff readings were observed with a level. The instrument having been moved after third, sixth and eighth reading. Enter readings and calculate the RL of the points by line of collimation method if first reading was taken at a staff held on BM 432.380m, 2.225, 1.600, 0.985, 2.090, 2.865, 1.260, 0.605, 1.980, 1.045, 2.685	10	L3	CO2
	b.	Explain the terms used in Theodolite surveying.	5	L2	CO2
	c.	Mention the advantages and limitations of Total station.	5	L2	CO2
		OR			
Q.4	a.	The following data shown in table were recorded from 4.00 m leveling staff with the dumpy level between two main stations A and B. The bench mark of station A is 650.450 m determine the reduced level of station B and conduct the necessary arithmetic checks.	8	L3	CO2
	b.	With the help of a tabular column explain the procedure for finding the horizontal angle by repetition method.	6	L2	CO2
	c.	Explain the features of total station.	6	L2	CO2

Sl.No.	Description about leveling staff reading
1	First reading at A = 0.685
2	Reading before changing the dumpy level = 3.850
3	Reading after changing the dumpy level = 0.920
4	Reading before changing the dumpy level = 3.545
5	Reading after changing the dumpy level = 0.945
6	Reading at B

		Module – 3			
Q.5	**a.**	Brief out the applications of contour in civil engineering.	**10**	**L2**	**CO3**
	b.	Explain longitudinal sectioning and cross sectioning.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Write short notes on creating job files and coordinate data recording in total station.	**10**	**L2**	**CO3**
	b.	Define Contour and list the characteristics of Contour.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Two tangents intersect at chainage 1190m, the deflection angle being 36° calculate all the data necessary for setting out a circular curve with radius of 300m by Rankine's method of deflection angle. The peg interval is 30m.	**12**	**L3**	**CO4**
	b.	A series of offsets were taken from a chain line to a curved boundary line at intervals of 15m in the following order, 0, 2.65, 3.80, 3.75, 4.65, 3.60, 4.95, 5.85, 5.60 m. Compute the area between the chain line, curved boundary and the end offsets by, (i) Trapezoidal rule (ii) Simpson's rule.	**8**	**L3**	**CO4**
		OR			
Q.8	**a.**	A simple circular curve is to have a radius of 573 m the tangent intersect at chainage of 1060m and the angle of intersection is 120°, find the (i) Tangent distance (ii) Degree of the curve (iii) Chainage at beginning and end of the curve.	**8**	**L3**	**CO4**
	b.	A road embankment is 10m wide at the formation level and has a side slope of 2 : 1 the ground level at every 80m along a centre line are shown in the table the formation level at zero chainage is 123.00 and embankment having a raising gradient 1 in 100. Calculate the volume of earthwork by prismoidal method. All readings are in m.	**12**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Define GPS. With a neat sketch, explain the segments of GPS.	**8**	**L2**	**CO5**
	b.	Explain the advantages and applications of drones in surveying compared to conventional method.	**8**	**L2**	**CO5**
	c.	Describe different types of drones commonly used in surveying.	**4**	**L2**	**CO5**
		OR			
Q.10	**a.**	Define Remote Sensing. Explain the applications of Remote Sensing and DGPS in Engineering Survey.	**10**	**L2**	**CO5**
	b.	Discuss the types of output maps generated through drone surveying.	**6**	**L2**	**CO5**
	c.	Discuss the importance of DGPS markers in ensuring survey accuracy.	**4**	**L2**	**CO5**

Distance	0	80	160	240	320
RL	120.8	122.5	123.4	123.8	124.5

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CBCS SCHEME

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BCV304

Third Semester B.E./B.Tech Degree Supplementary Examination, June/July 2024

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.

		Module – 1	M	L	C
Q.1	a.	Explain the different types of water demands.	10	L2	CO1
	b.	Describe the population of a city in 2011 by : i) Arithmetic increase method ii) Geo metric increase method iii) Increase metal increase method. Year: 1931 | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 Population (in towards): 12 | 16.5 | 26.8 | 41.5 | 57.5 | 68 | 74.1	10	L3	CO1
		OR			
Q.2	a.	Explain any five chemical characteristics of water.	10	L2	CO1
	b.	Compute the fire demand for the city having population of 140000 using various formulas and also explain the factors affecting fire demand.	10	L3	CO1
		Module – 2			
Q.3	a.	With a neat sketch, explain screen chamber.	10	L2	CO2
	b.	Find the dimension of a rectangular sedimentation basin with the following data : Volume of water to treated = 3MLD Detention period = 4 hrs Velocity of flow = 10 cm/min	10	L3	CO2
		OR			
Q.4	a.	With a neat sketch, and explain Jar test.	10	L2	CO2
	b.	Explain the rapid sand filter with a neat sketch.	10	L2	CO2
		Module – 3			
Q.5	a.	With a neat sketch explain break point chlorination.	10	L2	CO3
	b.	Explain any five chemical waste water characteristics.	10	L2	CO3

		OR			
Q.6	**a.**	Explain the classification of water carriage system along with their merits and demerits.	**10**	**L2**	**CO3**
	b.	Explain : i) self cleansing velocity ii) non-scouring velocity in sewage system.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the flow diagram of waste water treatment unit operations and unit process.	**10**	**L2**	**CO4**
	b.	With a neat sketch, explain the activated sludge process.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain i) HRT ii) SRT iii) F/M ratio iv) Sludge volume Index with respect to activated sludge process.	**10**	**L3**	**CO**
	b.	Explain any two modified activated sludge process.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	With a neat sketch explain trickling filter.	**10**	**L2**	**CO5**
	b.	With a neat explain rotating biological contractor.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	With a neat explain the oxidation pond.	**10**	**L2**	**CO5**
	b.	With a neat sketch explain aerobic and anaerobic sludge digesters.	**10**	**L2**	**CO5**

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CBCS SCHEME

USN | | | | | | | | | | |

BCV306D

Third Semester B.E./B.Tech Degree Supplementary Examination, June/July 2024

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.
3. Use of NBC : 2005, SP-35 : 1987 is allowed.

		Module – 1	M	L	C
Q.1	a.	Explain basic concepts of fire and fire as process of combustion.	10	L2	CO1
	b.	Explain fire resistance and standard fire.	10	L2	CO1
		OR			
Q.2	a.	Explain in detail ventilation and fuel controlled fire.	10	L2	CO1
	b.	Elaborate in detail effects of fire an construction material.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain escape and refuge plan for fire safety.	10	L3	CO2
	b.	Explain in detail flame spread, detection and suppression of fire for fire safety.	10	L2	CO2
		OR			
Q.4	a.	Write short notes on design of lift system for fire safety.	10	L3	CO2
	b.	Discuss the different cases in design of lift systems.	10	L3	CO2
		Module – 3			
Q.5	a.	Explain flow system of water and discuss the supply and demand.	10	L3	CO3
	b.	Briefly explain variable demand and diversity factor for water supply system.	10	L3	CO3
		OR			
Q.6	a.	Briefly explain control systems in flow systems for fire safety.	10	L3	CO3
	b.	Briefly discuss flow in pipe networks and fixture units.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain briefly HVAC and governing equations to HVAC process.	10	L3	CO4
	b.	Write short notes on design of electrical systems.	10	L3	CO4
		OR			
Q.8	a.	Describe the stages of maintenance management.	10	L3	CO4
	b.	Briefly explain building inspection, planned and Ad-hoc maintenance.	10	L3	CO4
		Module – 5			
Q.9	a.	Briefly explain condition survey and health evaluation of building.	10	L3	CO5
	b.	Write in detail effects of corrosion on concrete and alkali aggregate reaction.	10	L3	CO5
		OR			
Q.10	a.	Explain different types of non-destructive testing methods.	10	L3	CO5
	b.	Write short notes on : i) Repair ii) Rehabilitation iii) Retrofitting iv) Strengthening v) Maintenance.	10	L2	CO5

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CBCS SCHEME

USN | | | | | | | | | | |

BCV401

Fourth Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Analysis of Structures

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.	Find the static and kinematic indeterminacies of the following structures. Refer Fig.Q.1(a).	8	L3	CO1
	b.	Analyze the truss shown in Fig.Q.1(b) using method of joints. Indicate the forces in the members pictorially and tabulate the results.	12	L3	CO1
		OR			
Q.2	a.	Explain with examples, statically determinate and indeterminate structures.	6	L2	CO1
	b.	Find the forces in the members BC, BE and ED for the truss shown in Fig.Q.2(b). Use method of sections. Sketch appropriate figures by indicating sectional diagrams.	14	L3	CO1

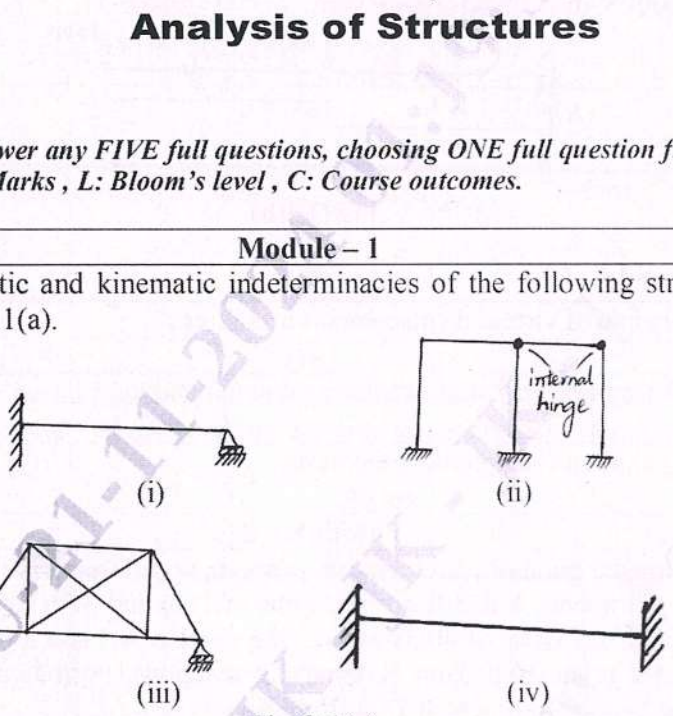


Fig.Q.1(a)

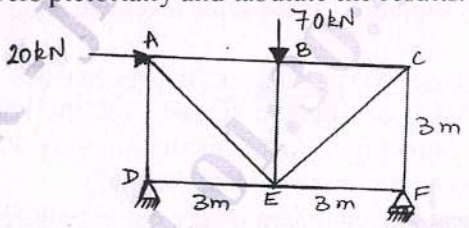


Fig.Q.1(b)

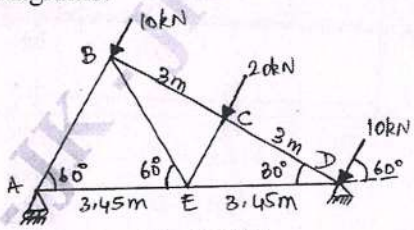
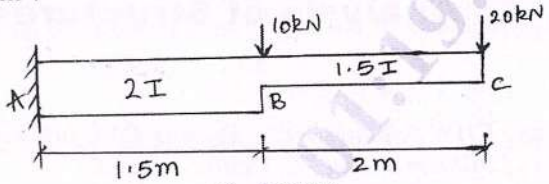
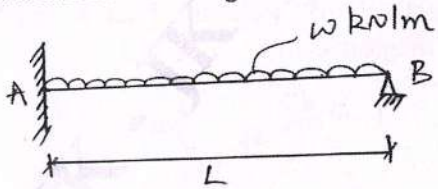
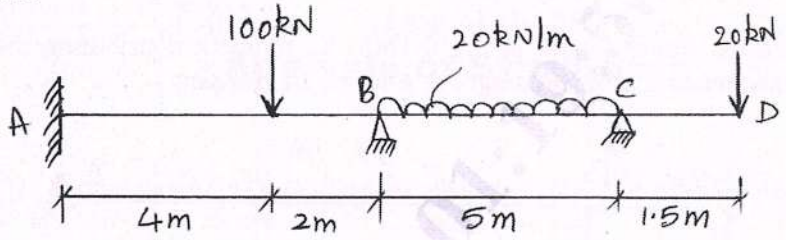
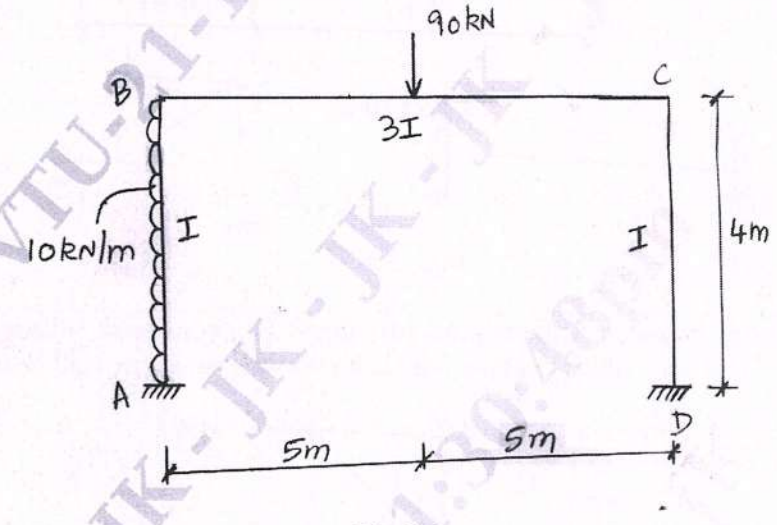
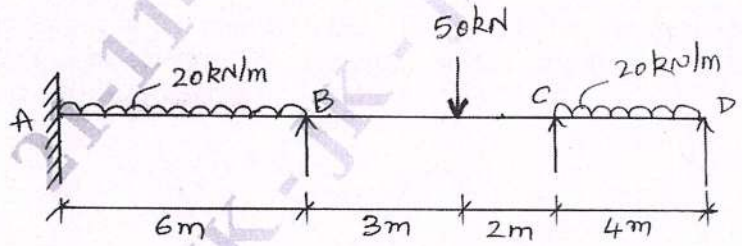


Fig.Q.2(b)

		Module – 2			
Q.3	**a.**	State and explain Mohr's theorems.	**6**	**L1**	**CO2**
	b.	Analyze the beam shown in Fig.Q.3(b) using moment area method. Take EI = 15000kN-m^2.  Fig.Q.3(b)	**14**	**L3**	**CO2**
		OR			
Q.4	**a.**	State principle of virtual displacements and forces.	**5**	**L1**	**CO2**
	b.	Derive the expression for strain energy due to bending.	**10**	**L2**	**CO2**
	c.	State and explain Castigliano's theorems.	**5**	**L1**	**CO2**
		Module – 3			
Q.5		A three hinged parabolic arch having supports at different levels is of span 60m. Its abutments A and B are at depths of 15m and 30m from crown C. The arch carries UDL of 40kN/m over the portion AC and a point load of 200kN at a point 10m from B. Find the reactions, normal thrust, radial shear and bending moment at 15m from support A.	**20**	**L3**	**CO3**
		OR			
Q.6	**a.**	Explain the method of deriving equations for cable profile and tension in the cable when it is supported at the same level and subjected to UDL.	**6**	**L2**	**CO3**
	b.	A cable of uniform section is suspended between two supports of 100m span. It carries a UDL of 10kN/m spread over the horizontal span. The lowest point of the cable sags 10m below the supports. Find: i) Maximum and minimum tension in the cable. ii) Minimum cross-sectional area of the cable required, if the allowable stress is 300MPa. iii) Length of the cable.	**14**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Analyze the propped cantilever shown in Fig.Q.7(a) by using slope-deflection method. Draw bending moment and shear force diagrams.  Fig.Q.7(a)	**8**	**L4**	**CO4**

	b.	Analyze the continuous beam ABCD shown in Fig.Q.7(b) by slope-deflection method. Draw bending moment diagram. Take EI constant.  Fig.Q.7(b)	12	L4	CO4
		OR			
Q.8		Analyze the portal frame subjected to loads as shown in Fig.Q.8. Consider sway effects also draw bending moment diagram. By slope deflection method.  Fig.Q.8	20	L4	CO4
		Module – 5			
Q.9		Analyze the continuous beam shown in Fig.Q.9 by moment distribution method. The support B sinks by 10mm. Take E = 2×10^5N/mm^2 and I = 120×10^{-6}m^4.  Fig.Q.9	20	L4	CO5

		OR			
Q.10	**a.**	Explain fixed end moments for different loading conditions with relevant diagrams.	**5**	**L2**	**CO5**
	b.	Analyze the frame shown in Fig.Q.10(b) by moment distribution method and draw bending moment diagram. Assume EI constant.	**15**	**L4**	**CO5**

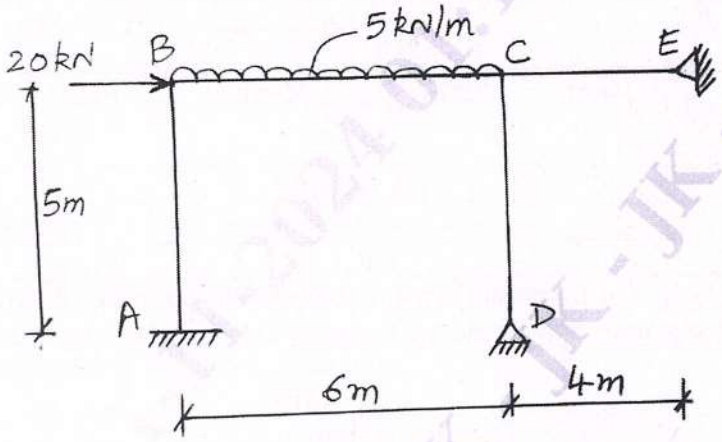


Fig.Q.10(b)

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CBCS SCHEME

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BCV402

Fourth Semester B.E./B.Tech Degree Supplementary Examination, June/July 2024

Fluid Mechanics and Hydraulics

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 and write their SI units. i) Density ii) Specific weight iii) Surface Tension iv) Capillarity.	6	L1	CO1
	b.	Derive an expression for capillary rise/fall of fluid in a tube of small diameter with sketches.	6	L2	CO2
	c.	Determine the minimum size of glass tube that can be used to measure water level, if the capillary rise in the tube is not to exceed 0.25mm. Take surface tension of water in contact with Air as 0.0735N/m.	8	L2	CO1
		OR			
Q.2	a.	State and prove Pascal's law.	6	L1	CO1
	b.	Define the following and mention their SI units. i) Total pressure ii) Centre of pressure.	6	L2	CO2
	c.	Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4m and altitude 4m. When it is immersed vertically in an oil of specific gravity 0.9. The base of plate coincides with the free surface of oil.	8	L3	CO2
		Module – 2			
Q.3	a.	Differentiate between : i) Uniform and non uniform flow ii) Steady and unsteady flow.	6	L2	CO2
	b.	Derive continuity equation for a three dimensional flow in Cartesian co-ordinates.	8	L2	CO2
	c.	The stream function for a two dimensional flow is given by $\psi = 2xy$, calculate the velocity at the point P(2, 3). Find the velocity potential function ϕ.	6	L3	CO2
		OR			
Q.4	a.	Obtain an expression for Euler's equation of motion along a stream line and deduce it to Bernoulli's equation.	10	L2	CO2
	b.	An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20cm and throat diameter 10cm. The oil mercury differential manometer shows a reading of 25cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$.	10	L3	CO2

		Module – 3			
Q.5	**a.**	Explain the classification of Notches and mouthpieces.	**6**	**L2**	**CO3**
	b.	Define hydraulic co-efficient (C_c, C_d, C_v) of an orifice and obtain the relation between them.	**6**	**L2**	**CO3**
	c.	Water flows over a rectangular Notch 1m wide at a depth of 150mm and after words passes through a triangular right angled notch. Taking c_d for the rectangular and triangular notch as 0.62 and 0.59 respectively. Find the depth over the triangular notch.	**8**	**L3**	**CO3**
		OR			
Q.6	**a.**	Explain major and minor losses in a pipe flow. Derive an expression for head loss due to sudden expansion in pipe line.	**10**	**L2**	**CO2**
	b.	Find the loss of head when a pipe of diameter 200mm is suddenly enlarged to a diameter of 400mm. The rate of flow of water through the pipe is 250 lit/sec.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Define the most economical channel section. Derive an expression for most economical rectangular section.	**10**	**L1**	**CO4**
	b.	A rectangular channel carries water at the rate of 400 lits/sec when bed slope is 1 in 2000. Find the most economical dimensions of the channel if C = 50.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define specific energy. Draw and explain specific energy curve.	**6**	**L3**	**CO4**
	b.	Define : i) Gradually Varied Flow (GVF) ii) Rapidly Varied Flow (RVF).	**6**	**L3**	**CO4**
	c.	Find the specific energy of flowing water through a rectangular channel of width 5m. When the discharge is $10m^3/sec$ and depth of water is 3m.	**8**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Define impulse momentum equation and give its applications with some examples.	**10**	**L2**	**CO4**
	b.	Define turbine. Give its classifications. Also explain heads and efficiencies of Pelton turbine.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	Draw a neat of Kaplan turbine and explain its different parts.	**10**	**L3**	**CO4**
	b.	A Pelton wheel is to be designed for following specifications : Shaft power = 11,773KW, Head = 380mts speed = 750rpm. Overall efficiency = 86% jet diameter not to exceed $1/6^{th}$ of wheel diameter. Determine : i) The wheel diameter ii) Number of jets required iii) Diameter of jet take $K_{v_1} = 0.985$ and $K_{u_1} = 0.45$.	**10**	**L3**	**CO4**

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BCV403

Fourth Semester B.E./B.Tech Degree Supplementary Examination, June/July 2024
Transportation 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.

		Module – 1	M	L	C
Q.1	a.	Explain the details of Jayakar committee and their recommendations.	10	L2	CO1
	b.	The speed of overtaking and overtaken vehicles are 70 and 40 kmph respectively on a two way traffic road. If the acceleration of overtaking vehicle is 0.99m/s^2. i) Calculate safe overtaking sight distance ii) Mention the minimum length of overtaking zone iii) Draw a neat sketch of overtaking zone and show the positions of sign posts.	10	L3	CO1
		OR			
Q.2	a.	List the types of road patterns. With usual notations draw any 4 road patterns.	10	L2	CO1
	b.	Calculate the length of transition curve and the shift using the following data : Design speed = 65 kmph Radius of circular curve = 220m Allowable rate of introduction of super elevation (pavement rotated about the centre line) = 1 in 150 Pavement width including extra widening = 7.5m.	10	L3	CO1
		Module – 2			
Q.3	a.	Explain the various applications of bituminous emulsion.	10	L2	CO2
	b.	Briefly explain the desirable properties of aggregates.	5	L2	CO2
	c.	Discuss the importance of highway drainage.	5	L2	CO2
		OR			
Q.4	a.	List and explain types of joints used in rigid pavement.	10	L2	CO2
	b.	The maximum quantity of water expected in one of the open longitudinal drain on clayey soil is 0.9m^3/s. Design the cross section and longitudinal slope of trapezoidal drain assuming the bottom width of trapezoidal section to be vertical : 1.5 horizontal. The allowable velocity of slow in the drain is 1.2m/s and Manning's roughness coefficient is 0.02.	10	L3	CO2
		Module – 3			
Q.5	a.	Explain the various road user characteristics.	10	L2	CO3
	b.	A vehicle of weight 2 tonnes skids through a distance equal to 40m before colliding with another parked vehicle of weight 1 tonne. After collision both the vehicles skids through a distance 12m before stopping. Compute the initial speed of the moving vehicle. Assume coefficient of friction as 0.5.	10	L3	CO3

		OR			
Q.6	**a.**	Explain the various vehicular characteristics.	**10**	**L2**	**CO3**
	b.	At a right angle intersection of two roads, road 1 has four lanes with a total width of 12m and road 2 has two lanes with a total width of 6.6 m. The volume of traffic approaching the intersection during design hour are 900 and 743 PCU/hour on the two approaches of Road 1 and 278 and 180 PCU/hour on two approaches of Road 2. Design the signal timings as per IRC guidelines.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain : i) Coning of wheels ii) Tilting of roads.	**10**	**L2**	**CO4**
	b.	For 12.8m rail length of BG track, calculate the quantity of materials required per kilometer length of track. Assume sleeper density to be equal to M+4. Type of rail – 90R.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Briefly explain : i) Permanent way ii) Railway station and yards.	**10**	**L2**	**CO4**
	b.	If 8° curve track diverges from a main curve of 5° in an opposite direction in the layout of a BG yard, calculate the super elevation and the speed on the branch line, if the maximum speed permitted on the main line is 45 kmph.	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	List and explain the aircraft characteristics affecting design and planning of airport.	**10**	**L2**	**CO5**
	b.	Explain the details of wind rose diagrams.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the factors to be considered for selection of airport site.	**10**	**L2**	**CO5**
	b.	The length of runway under standard condition is 126.m. The airport site has an elevation of 270m. Its reference temperature is 32.90°C. If the runway is to be constructed with an effective gradient of 0.20 percent, determine the corrected runway length.	**10**	**L3**	**CO5**

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