Programme:	B Tech Civil Engineering	Session: 2022-23
Semester:	IVth	Max. Time: 3 Hours
Course Title:	Fluid Mechanics II	Max. Marks: 70
Course Code:	BTCE 204 A	

Instructions:

1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Question 1

1a) Derive an equation for head loss in pipes head losses due to sudden expansion

1b) Derive a relation for the minimum specific energy.

1c) What are the values of hydraulic mean depth for triangular and circular channel section?

1d) What are the applications of the hydraulic jump?

1e) How will you define the weak jump and strong jump with the help of Froud number?

1f) Differentiate between HGL and TGL show with one example with the consideration of major losses.

1g) Define Gradually varied flow and Rapidly varied flow with an example. $(2 \times 7 = 14)$

Question 2 $(7 \times 2 = 14)$

2a)   A circular drainage pipe 0.80 m in diameter conveys a discharge at a depth of 0.30m. If the pipe is laid on a slope of 1 in 900. Estimate the discharge. Manning's n= 0.015.

2b)   Derive Chezy's equation for the velocity of flow in channels.

OR

2a)   A trapezoidal channel with side slopes of 2 horizontal: 1 vertical has to be designed to carry 15 m³/s at a slope of 1/5000. Determine the dimensions of the efficient section. Assume Manning's n = 0.014.

2b)   Derive an equation for the most efficient triangular section.

Question 3 $(7 \times 2 = 14)$

3(a)   Discuss about Specific Energy curve for open channel flow with the help of neat sketch.

3(b)   A hydraulic jump with initial Froude number of Fr = 5.0 takes place in a rectangular channel. Determine the loss of the head in the jump and critical depth of the channel flow, in terms of the initial depth y1 of the jump.

OR

3(a)   In a rectangular channel 3.5 m wide laid at a slope of 0.036, uniform flow occurs at depth of 2 m. Find how can the hump be raised without causing afflux? If the upstream depth of flow is to be raised to 2.5 m, what should be height of the hump? Take Manning's equal to 0.015.

3(b)   Derive an equation for the momentum in open channel flow – specific force.

Question 4   (7x2 = 14)

4(a)   Derive an equation for the computation of the water surface profile in a wide rectangular channel using the step method for gradually varied flow.

4(b)   A rectangular channel 7.5 m wide has a bed slope of 1 in 3000. If the due to weir the constructed at the downstream end of the channel, water surface at a section is raised by 0.75 m, determine the water surface the slope with respect to the horizontal at this section. Assume Manning's n = 0.02.

OR

4(a)   Classify water surface profiles M1, S3, S1, C2, C3, H3 & A3 with neat diagram.

4(b)   A 3.5 m wide rectangular channel has a longitudinal slope of 175 mm/km and Manning's n = 0.015. When the discharge in the channel is 1.20 m^3/sec, estimate the slope of water surface in the channel relative to horizontal, at a section where the depth of flow is 0.90 m.

Question 5   (7x2 = 14)

5(a) Derive an expression for shear stress on the basis of Prandtl Mixing Length Theory.

5(b) Two reservoirs are connected by a pipeline consisting of two pipes, one of 15 cm diameter and length 6 m and other diameter 22.5 cm & 16 m length. It the difference of water levels in the two reservoirs is 6 m, calculate the discharge & draw the energy gradient line. Take f = 0.04.   OR

5(a) The population of a city is 800000 and it to be supplied with water from a reservoir 6.4 km away. Water is to be supplied at the rate of 140 lt/head /day and half the supply is be delivered in 8 hrs. The fully supply level of the reservoir is R.L .180.00 and its lowest water level is R.L 105.00. The delivery and of the main is at R.L 22.50 and the head required there is 12m. Find the diameter of the pipe. Take f=0.04.   (7)

5(b) Derive an equation for the velocity distribution in rough pipes. In turbulent flow.   (7)

Course Code: BT CE 206A   Max Time: 3 hrs
Course Title: Geomatics Engineering   Max Marks: 70

Instructions:

Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1 Define the following terms:-

    a) Platform

    b) Black Body Radiation

    c) Orbital Period

    d) Sidelap

    e) Nadir

    f) Digital Image

    g) Map Projection

PART –II

Q. No.2 Explain the importance of maps in Geomatics Engineering. Also, briefly explain different terminologies used in map making.

OR

Q. No.2 Differentiate between GPS and GIS. Write down the applications of coordinate system in various branches of civil engineering.

Q. No.2 What are satellite constellations and signal? What do you understand by GCS and PCS? Discuss.

Q. No.3 Briefly explain different laws being applicable from time to time in remote sensing.

OR

Q. No 3 Explain energy interactions in detail with suitable examples.

Q. No 3 What is spectral reflectance curve? Also, explain interaction of earth surface with EMR in different regions.

Q. No.4 Explain different types of platforms and sensors with neat diagrams. Explain radiometric corrections and Image histogram.

OR

Q. No .4 What do you understand by orbital characteristics? Explain in detail with neat diagrams. What is data processing in ArcGIS? Discuss.

Q. No.4 Explain spatial resolution and spectral resolution in detail. What are geometric corrections? Discuss.

Q. No.5 Explain different types of data models being used in GIS. What do you mean by GIS data base management system? Explain.

OR

Q. No.5 Explain hyperspectral remote sensing and its applications in detail.

Q. No.5 What are different components of GIS? Explain. What is geo-referencing and digital representation of geographic data? Discuss.

Programme: B.Tech.   Session: 2022-23
Semester: IV   Max. Time: 3 Hours
Course Title: Structural Analysis I   Max. Marks: 70
Course Code: BT CE 202 A

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1.   (2X7=14)

a)   Discuss the relationship between Slope, Deflection and Radius of Curvature of a simply supported beam?

b)   Find degree of static and kinematic indeterminacy in the given figure.
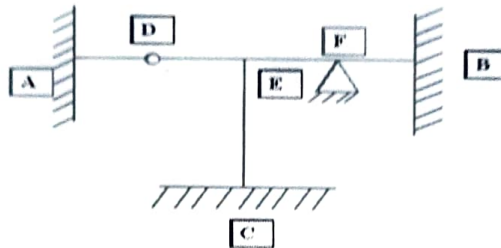
c)   Discuss in details about the Principal of Superposition.
d)   Discuss in detail about the Eddy's Theorem used in analysis of Arch
e)   Derive the General Cable Theorem for Suspension and Cable Bridges.
f)   Discuss the Temperature stresses developed in suspension cable.
g)   Describe the Muller –Breslau Principal for the influence line diagram.

Q 2.   (2X7=14)

a)   With the help of moment are method find the deflection of the cantilever beam at its free end if a cantilever beam of span 2.5 m is subjected to gradually varying load from zero at the free end to 40 kN/m over fixed end. Take EI for the cantilever beam as 13×10^{12} N-mm²

b)   Find the forces in the member of given Truss.
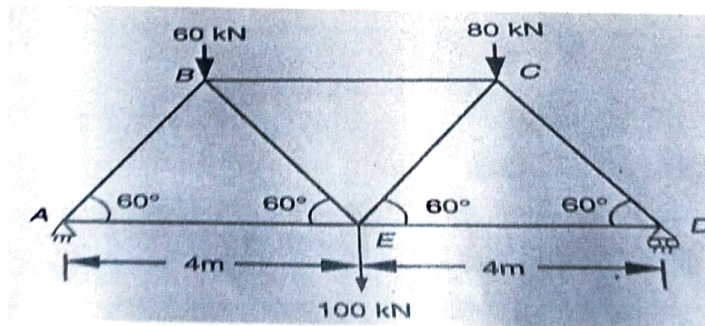

c)   A beam ACB of length L, simply supported at the ends has moment of inertia 4I for the length AC and I for the length CB and is loaded with point load W at C. Using Conjugate beam method determine i) slope at end A and ii) deflection at mid span. Also compute the numerical values taking W= 8kN, length of CB portion is 2.5 m and total length (L) of beam ACB is 12.5 m, I = 5000cm⁴ and $E = 2 \times 10^5$ N/mm²

Q 3.   (2X7=14)

a)   A beam ABC, 10 m long fixed at ends A and B is continuous over Joint B is loaded as shown in fig. Using Slope Deflection method, compute the end moment and plot the bending moment diagram

El constant
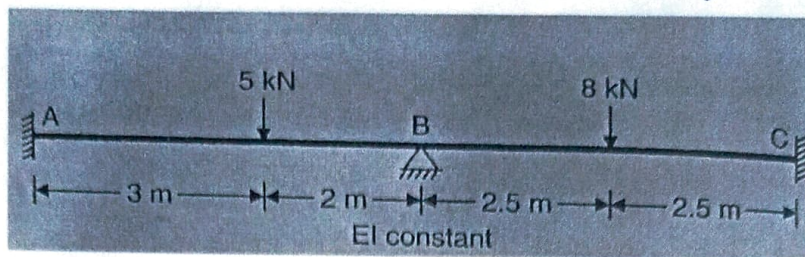
b)   A beam ABC of length 2L rest on three supports equally spaced and is loaded with U.D.L w/unit length throughout the length of the beam. Draw the Shear Force and Bending Moment diagram for the beam.

c)   Derive the Clapeyron's equation of three moments for No Settlement and General Loading condition, considering two consecutive spans AB and BC having length L1 and L2 respectively. Consider EI as constant.

Q 4.   (2X7=14)

a)   Two-wheel loads 80kN and 200kN, spaced 2m apart move on a girder of span 16m. Find the maximum positive and negative shear force and Bending moment that can occur at a section 6m from the left end. Any wheel load can lead the other.

b)   A simply supported girder has a span of 12m. A 200kN wheel load move from one end to the other end on the span of the girder. Find the maximum Shear force and Bending moment which can occur at a section 4m from the left end.

c)   Four-wheel loads of 6, 4, 8 and 5 kN cross a girder of 20 m span, from left to right followed by U.D.L. of 4 kN/m and 4 m long with the 6 kN load leading. The spacing between the loads in the same order are 3 m, 2 m and 2 m. the head of the U.D.L. is at 2 m from the last 5 kN load. Using influence lines, calculate the Shear force and bending moment at a section 8 m from the left support when the 4 kN load is at centre of the span.

Q 5.   (2X7=14)

a)   A Parabolic Arch AB hinged at the ends A and B has a span of 60 m and a rise of 12 meter. A concentrated load of 8 kN acts at 15 meters apart from the left hinge A. the second moment of area varies as the secant of the inclination of the arch axis. Calculate the horizontal thrust and reaction at the hinges. Also calculate the net bending moment at the section.

b)   A light cable, 18 meter long, is supported at two ends at the same level. The supports are 16 meters apart. The cable supports three loads of 8, 10 and 12 N dividing the 16-meter distance in four equal parts. Find the shape of the string and tension in various portions.

c)   A symmetrical parabolic arch with a central hinge, of rise r and span length L is supported at its ends on pins at the same level. What is the value of the horizontal thrust when a load W which is uniformly distributed horizontally covers the whole span?

Course Code: BT CE 208A   Max Time: 3 Hrs
Course Title: Transportation Engineering - I   Max Marks: 70

Instructions:
- Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
- Question no. 2 to 5 **(PART-II)** have three parts and students need to answer any two parts of each question. Each part carries seven marks.
- Use of Scientific Calculator is allowed for examination.

PART I

Q1. Write short notes on the following: (7 X 2 = 14)

    (a) PCU

    (b) ESWL

    (c) Reaction Time

    (d) Obligatory Points

    (e) Road Safety Audit

    (f) Pavement Unevenness

    (g) Extra Widening of Pavement

PART II

Q2. (a) A vertical summit curve is formed at intersection of two gradients,   (2 X 7 = 14)
+3.0 and -5.0 percent. Determine the length of Summit curve to provide a stopping sight distance for a design speed of 80 kmph. Assume remaining data suitably.

    (b) A new road is to be constructed between two points, suggest different methods for carrying out traffic volume studies. Further briefly discuss different methods of representing data from such study.

    (c) Highlight the requirements from soil as a subgrade material. Further discuss CBR test of soil.

Q3. (a) Define Overtaking Sight distance. Also determine the desirable   (2 X 7 = 14)
lengths of the overtaking zone for the following data:
Speeds of overtaking and overtaken vehicles are 80 and 60 kmph respectively, Average reaction time for driver and acceleration for overtaking vehicle are 2 seconds and 1m/sec² respectively, vehicle

approaching from opposite direction is moving with a speed of 50 kmph.

(b) Define PCU. Further with the help of neat diagram discuss different level of services as per HCM.

(c) With the help of neat and clean diagrams discuss the load transfer mechanisms for both flexible and rigid pavements.

Q4. (a) Enlist and explain different traffic control devices in detail.   (2 X 7 = 14)

(b) Discuss the classification of roads. Further briefly discuss the requirements of an Ideal Alignment for road.

(c) Calculate the total width of a pavement on a horizontal curve for a new 2 lane national highway to be aligned along a hilly terrain with ruling minimum radius. The design speed and length of wheel base of the vehicle are to be taken as 80 kmph and 6 m respectively. Assume remaining data suitably.

Q5. (a) Discuss the desirable properties of aggregates to be used for road   (2 X 7 = 14) constructions. Further enlist different tests used for investigating the properties of aggregates.

(b) Discuss different Bituminous materials used for pavement construction.

(c) Explain IRC method for design of flexible pavement.

Course Code: BT CE 218A   Max Time: 3 Hr
Course Title: Mechanical Engineering   Max Marks: 70

Instructions:

Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1

(a) What is zeroth law of thermodynamics.
(b) Discuss Rankine Cycle.
(c) Write a short note on two stroke engine.
(d) Discuss screw jack with figure.
(e) Discuss the function of clutch.
(f) Discuss stress-strain diagram of ductile material.
(g) Coefficient of performance of heat pump.

PART –II

Q. No.2 a) What is the difference between water and fire tube boiler. Discuss Carnot cycle and find out efficiency.

b) 2 kg of an ideal gas is compressed adiabatically from pressure 100 kPa and temperature 220 K to a final pressure of 400 kPa. Make calculations for: (a) initial volume, (b) final volume and temperature (c) work performed, (d) heat added to or subtracted from the system, and (e) change in internal energy. It may be presumed that for the given ideal gas:-
C_p=1 kJ/kg K and C_v = 0.707 kJ/kg K.

OR

Q. No.2 a) write the construction and operational details of Cochran boiler with figure.

b) What is second law of thermodynamics. What is coefficient of performance (COP) of heat pump and refrigeration system.

Q. No.3 a) Write the construction and working detail of 4-stroke Diesel engine.

b) Discuss the simple vapour compression refrigeration cycle.

OR

Q. No 3 a) Drive the efficiency of otto and diesel cycle with figure in P-V and T-S diagram.

b) A heat pump is used to meet the heating requirements of a house and maintain it at 300 K. On day when the outdoor air temperature drops to 275 K, it is estimated that the house loses heat a the rate of 75 MJ/hr. If the coefficient of performance of the heat pump under these conditions is 2.5, determine:
(1) the power consumed by the heat pump, and
(2) the rate at which heat is absorbed from the cold outside air

Q. No.4 a) Write the classification of water turbine. Write the difference between Impulse and reaction turbine.

b) Discuss the following terms: - 1) Simple Machine, 2) Velocity Ratio, 3) Mechanical Advantage, 4) Efficiency, 5) Law of Machine, 6) Efficiency, 7) Reversibility and irreversibility of machine. **(Note- All parts must be written at one place)**

OR

Q. No .4 a) What is turbine. Write the construction and working details of Pelton wheel turbine.
b) A single purchase crab has the following details:
Length of handle =40 cm
Diameter of load drum=20 cm
Number of teeth in the pinion=16
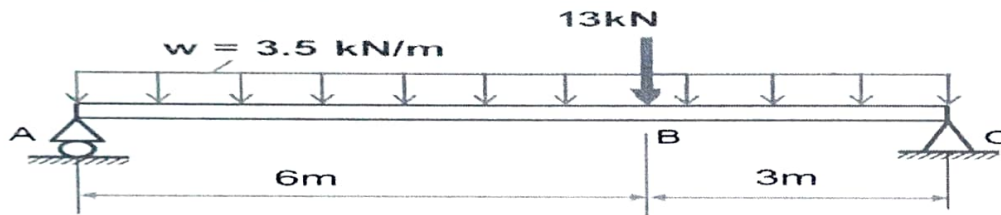Number of teeth in the spur=80
Calculate: -
1) Velocity ratio
2) Effort required to raise the load of 2 KN with an efficiency of 75%.
3) Mechanical Advantage.

Q. No.5 a) Find shear force and bending moment at point A, B and C also draw the shear force and bending moment diagram.


b) Discuss the different types of gear train with figure and velocity ratio.

OR

Q. No.5 a) What is function of clutch. Discuss the different types of clutches with figure.
b) A mild steel member ABCD is subjected to axial loading as shown in figure. Calculate the force P. Determine also the change in length and stresses of each section as well as net change in length of the member. $E = 200 \, GPa$.
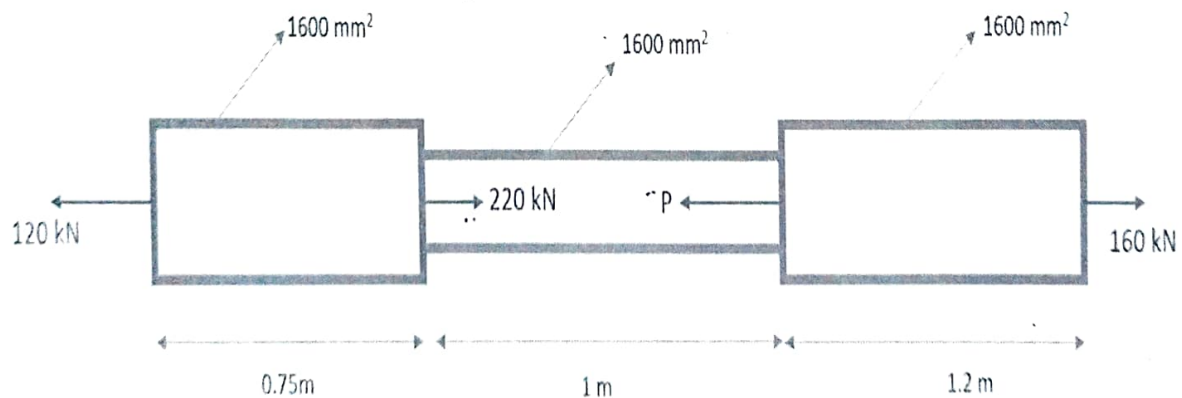
Programme: Generic Elective Course (GEC)   Session: 2022-23

Semester: IV   Max. Time: 3 Hours

Course Title: Physical Fitness and Conditioning   Max. Marks: 70

Course Code: SOE PLS 030402 GE C4004

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student are required to answer any two parts of each question. Each part carries seven marks.

Q 1.

(4X3.5=14)

a) Elaborate on the health-related physical fitness components.

b) Describe aerobic and anaerobic activity and provide a suitable running event.

c) Describe weight training and make a detailed table for fix a set, intensity, and repetition (SIR).

d) Discuss each 5 exercises from upper body and lower body.

e) Describe various body types and how they perform in the sport.

f) Define posture and describe its classifications.

g) Write down the procedure for finding 1RM.

Q 2.

(2X7=14)

a) Write down the importance of physical fitness and conditioning in the current scenario.

b) Elaborate the skill related physical fitness components.

c) List down the warming up and cooling down exercise and explain their benefits.

Q3.

(2X7=14)

a) Write down the principle of sports training with suitable example.

b) Describe any seven Swiss ball workouts and their advantages by using a suitable stick diagram.

c) Enumerate the various methods of sports training.

Q 4.   (2X7=14)

a) Explain the procedure for analyzing a human body with the help of anthropometric tool.

b) Describe any seven postural deformities and its corrective exercises for using suitable drawings.

c) Explain the various assessing tools for body composition and make a standard table for BMI level.

Q 5.   (2X7=14)

a) List out and elaborate the exercises for during pregnancy, back pain and neck pain management.

b) Describe Flexibility and the way of improving Flexibility for the un-trained person.

c) Prepare a 14 days training schedule for gym workout.