7569343

Test cross is an expt in which an organism showing dominance for a dp. trait has to be tested for its genotype. when an organism shows a dominant character, it could be homozygous or heterozygous for that character using the homozygous recessive organism, the genotype of the organism can be tested.

parent Test cross

F_1: TT × tt

Tt

F_2: Tt × tt

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/ DEPT/ BS-CH(ME) 301/ 2022-23

2022

BIOLOGY

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A

[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions 5X2=10

1. Write two examples of basic amino acids.
2. What do you mean by exergonic reaction?
3. What do you mean by gram positive bacteria?
4. What is peptide bond?
5. What is nucleotide?

GROUP-B

[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions 15X4=60

6. Classify carbohydrate with suitable examples.
7. Describe the dihybrid cross experiment of Mendel. Define test cross with a suitable example. (10+5=15)
8. Describe the molecular structure of DNA described by Watson and Crick. Write three differences between DNA and RNA. (12+3=15)
9. Describe the classification of bacteria.
10. Describe the microbial growth curve. Classify different types of enzyme. (5+10=15)
11. Describe the different types of protein structure.
12. Describe different theories of enzyme action. Enumerate various types of enzyme inhibition. (10+5=15)

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
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JGEC/B.TECH/CIVIL ENGINEERING/ES-CE301/2022-23

2023

FLUID MECHANICS & HYDRAULIC MACHINES

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.

Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. Define wetting fluid and non-wetting fluid using the concept of capillarity. 2
2. Write down general differential equation for incompressible flow and irrotational flow in vector form. 1+1
3. State conditions for gradual and sudden closure of the valve. 1+1
4. Define suction head and static head of a centrifugal pump. 1+1
5. What is cavitation? 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***five*** questions 12x5 =60

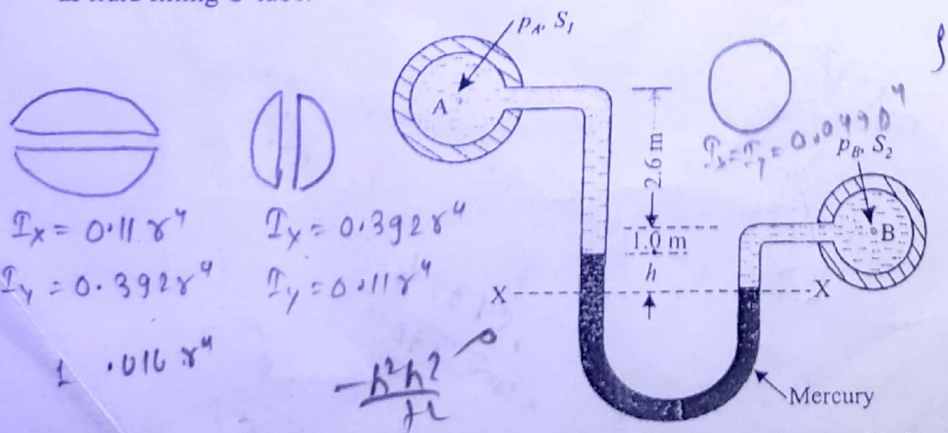
6. i) A U-tube is made up of two capillaries of bores 1.0 mm and 2.2 mm, respectively. The tube is held vertically with zero contact angles. It is partially filled with liquid of surface tension 0.08 N/m. If the estimated difference in the level of two menisci is 14.8 mm, determine the mass density of the liquid. 5

   ii) Two large plane surfaces are 5.8 cm apart. The space between the surfaces is filled with glycerine. What force is required to drag a very thin plate of surface area 0.65 m^2 between the two large plane surfaces at a speed of 1 m/s, if the thin plate is at a distance of 1.76 cm from one of the plane surfaces? Take dynamic viscosity of glycerine = 8.1×10^{-1} Ns/m^2. 7

7. i) The resisting force F of a plane during flight can be considered as a dependent upon length of aircraft (l), velocity (v), air viscosity (μ), air density (ρ), and bulk modulus of air (K). Express the functional relationship between these variables and resisting force using dimensional analysis. 8

   ii) State and explain (with suitable sketches) the conditions of equilibrium of 4
   a) Floating body
   b) Submerged body

8. i) Figure shows a U-tube differential manometer connecting two pressure pipes at A and B. The pipe A contains a liquid of specific gravity 1.6 under a pressure of 110 kN/m^2. The pipe B contains a liquid of specific gravity 0.8 under a pressure of 200 kN/m^2. Find the difference of pressure measured by mercury as fluid filling U-tube. 6



   ii) A solid cylinder 2m in diameter and 2m high is floating in water with its axis vertical. If the specific gravity of the material of cylinder is 0.65, find its metacentric height. State also whether the equilibrium is stable or unstable. 6

9. i) Show how variable density fluid can satisfy incompressible flow equation?
ii) Find the acceleration components at a point (1,1,1) and t=2sec for the following flow field. 2 6
$u = 2x^3+6y^2z+z+5t$, $v = -3x+5y^3-7xzt$, $w = -1.5z^2x+7yz-3tx$
iii) The velocity potential function for a flow is given by $\Phi = 5(x^2-y^2)$. Calculate the velocity components at point (2,3). Also determine stream function for the flow. 4

10. i) Determine the total pressure and centre of pressure on a triangular plate of base 4.5 m and altitude 6.2 m when it is immersed vertically in an oil of specific gravity 0.95. The base of the plate coincides with the free surface of oil. 6
ii) An oil of specific gravity 0.85 is flowing through a venturimeter having an inlet diameter 18 cm and a throat diameter 8 cm. the oil-mercury differential manometer shows a reading of 24 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$. 5
iii) What is moment of momentum principle. 1

11. i) Three pipes of 450 mm, 360 mm and 390 mm of diameters have lengths of 200 m, 400m and 300 m respectively. They are connected in series to make a compound pipe. The ends of this compound pipe are connected in series to make a compound pipe. The ends of this compound pipe are connected with two reservoirs whose difference in water levels is 15.5 m. If coefficient of friction for these pipes are 0.005, 0.0025, 0.0067 respectively; determine the discharge through the compound pipe considering all possible major and minor losses. 8
ii) A pipe of diameter 1.8 m is required to transport an oil of specific gravity 0.82 and viscosity 0.03 poise at a rate of 4000 lit/s. Tests were conducted on a 13 cm diameter pipe using water at 20°C. Find the velocity and rate of flow in the model. Viscosity of water at 20°C = 0.01 poise. 4

12. i) A ring main consists of a quadrilateral network ABCD and a triangular network ADE, the pipe AD being common to both networks. The resistances of the pipelines are AB= 4, BC = 2, CD = 5, DA= 4, AE = 2, DE = 3 units. Let a flow of 10 units enter at E and flows of 3, 4, 3 units leave at B, C, D respectively. Determine the magnitudes of the pipe flows to an accuracy of 0.1 flow unit and indicate their directions on the sketch. 12

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/CE/MC-CE301/2022-23
2022
ENERGY AND ENVIRONMENTAL SCIENCE

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. Define noise pollution. 2
2. What do you mean by solid waste management 2
3. What is energy flow in ecosystem? 2
4. What is waste land reclamation? 2
5. What is genetic biodiversity? 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***five/ four*** questions 12x5 /4x15=60

6.(i) What are renewable and non renewable energy sources? Why are renewable energy sources preferred for energy utilization nowadays 10

(ii) What are the different possibilities for energy storages? 5

7. Explain the forest and desert ecosystem in detail 15

8. Write some significant acts related to environment 15

9.(i) Explain the causes, effects and control measures of air pollution. 9

(ii) What is soil pollution? Explain. 6

10.(i) What is an earthquake? Enumerate its effect. What measures should be taken to mitigate this disaster? 9

(ii) What are the objectives of water conservation? 6

11.(i) Explain the following 6
(a) Ecological succession (b) Food chain

(ii) What are the different values of biodiversity? Explain 9

12.(i) Explain some of the case studies in connection with the pollution. 10

(ii) What is the role of an individual in prevention of pollution 5

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/CIVIL ENGINEERING/PC-CE302/2022-23

2023

ENGINEERING GEOLOGY

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

5x2=10

Answer *all* questions

1. What is Secondary Blasting? 2
2. What is Regolith? 2
3. What is Cleavage of a mineral? 2
4. What is Transparency of mineral? 2
5. What is a Centre of symmetry in regard of regularity of crystal forms of minerals? 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

12x5 = 60

Answer any *five* questions

6. i) What is Aquifer? What are the different types of Aquifers? Describe with neat sketch. 1+3
   ii) What is Porosity? Define Permeability. What is Specific yield? 3
   iii) What are the different types of earthquake resistant structures? Describe. What is Reservoir-induced Seismicity (RIS)? 4+1

7. i) What is Crystal Habit of minerals? Describe all the Habits. 1+4
   ii) What is Steak of mineral? What is Luster of mineral? What are the different types of lusters? 1+1+1
   iii) What are the prevention and mitigation measure can be taken to control landslides? 4

8. i) What is Chemical Weathering of Rocks? What are the factors affecting Chemical Weathering? 2+3
   ii) What is Biological Weathering of Rocks? What are the Alluvial (riverborne) deposits? 2+3
   iii) What is Epicenter and Focus of Earthquake? 2

9. i) What is Petrology? Define Rock. 2
   ii) What is Metamorphism? Describe different types of Igneous rock. 1+5
   iii) What are the factors or agents of Metamorphism? Describe. 4

10. i) Describe the process of Sedimentary Rock formation. 6
    ii) What is Exfoliation? Describe Spheroidal Weathering. 1+3
    iii) What is block disintegration? What is Seawall? 1+1

11. i) What are Stable slope and Unstable slope? Describe. 3
    ii) Describe the classification of different mineral groups. 4
    iii) What Diaphaneity of minerals? What are different types of Diaphaneity? Describe. Define fracture. 1+3+1

12. i) What are the Geological factors considered in Tunnelling projects? What are the Stages of the geological investigation carried out for the tunneling projects? 3+4
    ii) What is Tenacity of mineral? Descriptive terms for the tenacity of minerals. 1+4

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/CE/BS-M(CE)301/2022-23

2022

MATHEMATICS - III

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. Show that the function f defined by $f(t) = \begin{cases} -1, & 0 \le t < 2 \\ 1, & t > 2 \end{cases}$ is piecewise continuous on every finite interval $0 \le t \le b$ for every positive number b. 2

2. Give an example of a graph which is Hamiltonian but not Eulerian and an example of a graph which is Eulerian but not Hamiltonian. 2

3. Eliminate the arbitrary constants a and b from the equation $2z = (ax + y)^2 + b$ 2

4. Find $F^{-1}\left\{\frac{1}{1+p^2}\right\}$. 2

5. Show that $var(ax + b) = a^2 var(X)$. 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***five*** questions 12x5 = 60

6. i) Find $L\{f(t)\}$ where $f(t) = t^2 \sin bt$ 3

ii) Find the Laplace transform of f defined by $f(t) = \begin{cases} \sin t, & 0 < t < \pi \\ 0, & \pi \le t < 2\pi \end{cases}$ with $f(t + 2\pi) = f(t)$ 4

iii) Find $L^{-1}\left\{\frac{3s+1}{(s-1)(s^2+1)}\right\}$ 5

7. i) Find the Fourier sine transform of $f(x) = \frac{1}{xe^x}$ 4

ii) Find the Fourier transform of $f(x) = e^{-x^2}$ 4

iii) Find the function $f(x)$ whose Fourier cosine transform is $\frac{\sin ap}{p}$ $[a > 0]$ 4

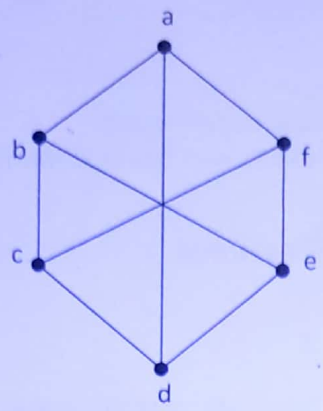
8. i) Find the general solutions of the following PDE : 4

$x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$.

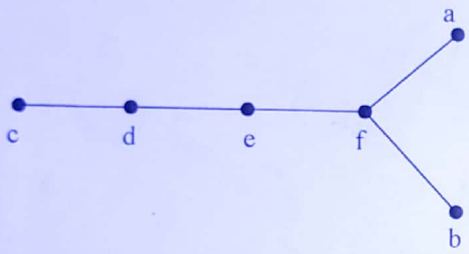
ii) Solve $(D^2 - DD')z = \sin x \sin 2y$ 4

iii) Solve the PDE $(x^2D^2 - y^2D'^2 + xD - yD')z = x^2y$ 4

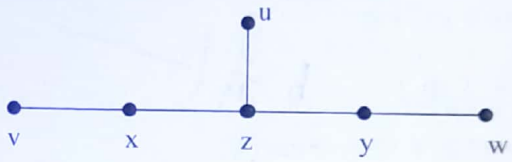
9. i)Define complement $\bar{G}$ of a simple graph G .Draw the complement of a graph G with vertices a, b, c, d, e, f as given below : 1+2



ii) Examine whether the graphs G_1 and G_2 (given below) are isomorphic or not : 4



G

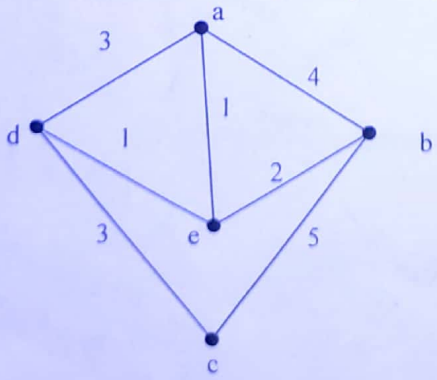


G'

iii) If a graph G has exactly two vertices of odd degree, show that there must be a path joining these two vertices. 5

10. i) Define a spanning tree of a connected graph. Prove that a graph G has a spanning tree iff G is connected. 1+(2+2)

ii)Use Prim's algorithm to find the minimal spanning tree in the graph G given below : 4



iii) Find the number of pendent vertices in a binary tree . 3

i) Solve the initial-value problem $\begin{cases} \frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5y = e^{-t}\sin t \\ y(0) = 0 \\ y'(0) = 1 \end{cases}$ 6

ii) Using the method of Fourier transform, find the deflection $u(x,t)$ of an infinite string, given that the string is initially at rest and that the initial deflection is $f(x), -\infty < x < \infty$. 6

12. i) Find the value of k such that $f(x) = \begin{cases} kx(1-x), 0 < x \le 1 \\ 0 \quad elsewhere \end{cases}$ is a possible probability density function. Also, compute $P(X > \frac{1}{2})$ and $E(X)$. 2+2+2

ii) Find mean and variance of Binomial (n, p) distribution. 3+3

13 i) An urn contains 7 red and 6 black balls. Two balls are drawn without replacement. What is the probability that the second ball is red if it is known that the first is red. 5

ii) (b) A random variable X has the following probability mass function 1+2+1+1+2

$X = x$	0	1	2	3	4	5	6	7
$P(X = x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

a) Determine k

b) Evaluate P(X<6) and P(3<X<7)

c) Find $P(3 < \frac{X}{X} \le 6)$

d) Find the minimum value of X so that $P(X \le x) > \frac{1}{2}$

Obtain the probability distribution function $F(x)$.

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/CIVIL/ES-CE302/2022-23

2022

ENGINEERING MECHANICS

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

5x2=10

Answer ***all*** questions

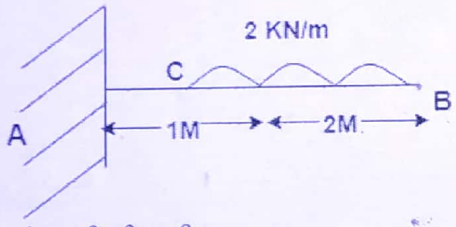
1. Discuss about two force body or two force members — 2
2. Explain the statement, "Two equal and opposite parallel forces constitutes a couple". — 2
3. What are the conditions under which the centre of gravity of a body becomes the same as its centroid? — 2
4. State the transfer formula for product of inertia. — 2
5. State the principle of impulse-momentum. — 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

12x5 =60

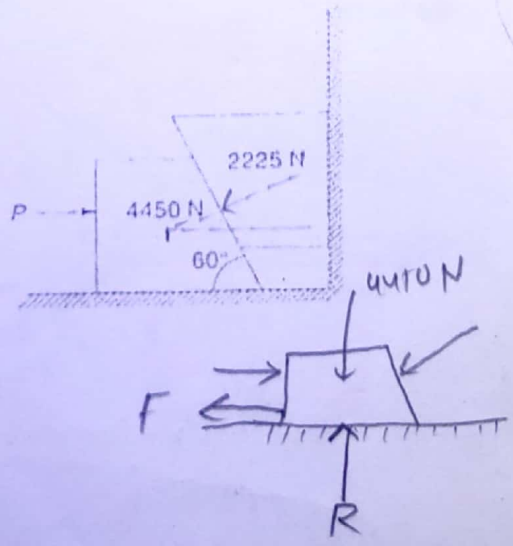
Answer any ***five*** questions

6. i) What is the SF at support B? — 2



ii) What is meant by specification of a force? — 2

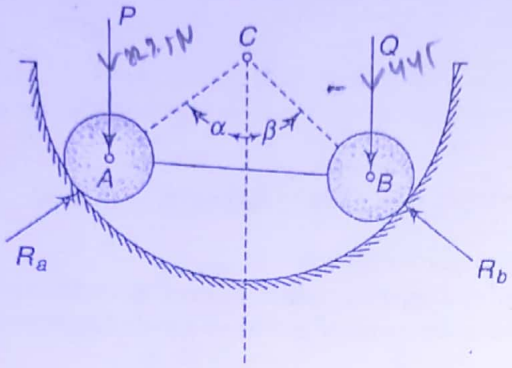
iii) Referring to figure the coefficients of friction are as follows: — 8
0.25 at the floor: 0.30 at the wall: 0.20 between blocks
Find the minimum value of a horizontal force P applied at the lower block that will hold the system in equilibrium.



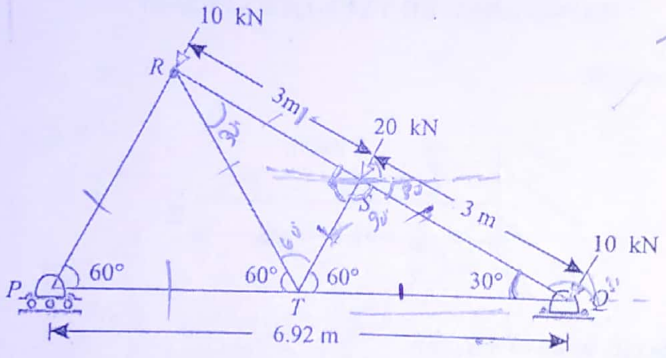
M = f - force of
R → resultant.

f = M - R

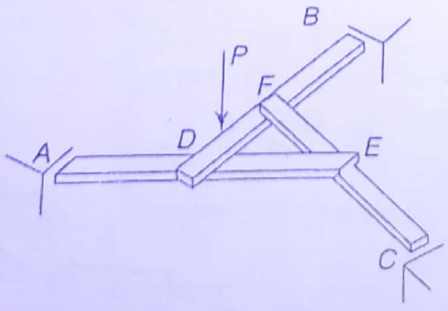
7. A rigid bar with rollers of weights P=222.5 N and Q=445 N at its ends is supported inside a circular ring in a vertical plane as shown. The radius of the ring and the length AB are such that the radii AC and BC form a right angle at C, i.e. $\alpha + \beta = 90°$. Neglecting friction and weight of the bar AB, find the configuration of the equilibrium as defined by the angle $(\alpha - \beta)/2$ that makes with the horizontal. Find also the reactions R_A and R_B and the compressive force S in the bar AB 12



8. Find all the member forces in the truss due to applied load as shown in figure. 12



9. Three identical bars of length l are arranged and supported in a horizontal plane as shown in figure. Each bar supports the end of another at its midpoint so that DEF is an equilateral triangle with sides of length l/2. Find reactions at A,B,C and interactions at D,E,F due to vertical load P applied midway between D and F on the bar DB 12



10. i) Determine the coordinate Xc and Yc of the centroid C of the area of one quadrant of a circle OAB with radius 'r' 5

UDL, point load

Truss →

deflection of beam → (deviation)

variation of stress with aspect of cross section

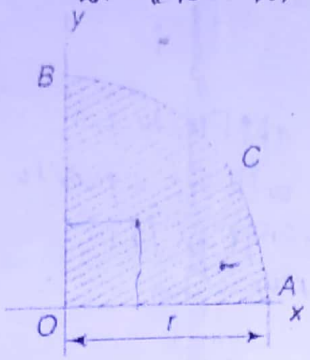
bi-axial stress, mohr's circle

Hoop's stress

meridional stress

column

Torsion



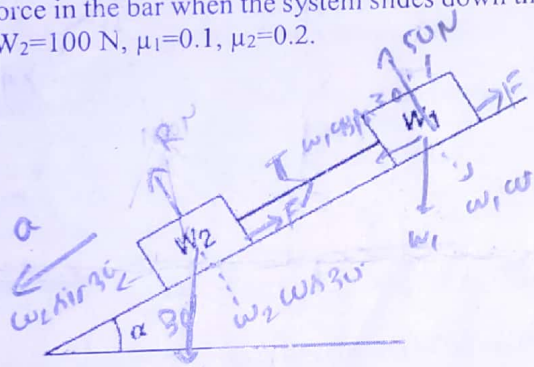
The intersection of the axis of reference with illuminating surface, E/S

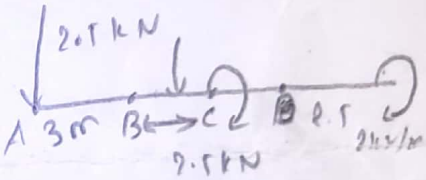
7

ii) The two vertical forces P =2.5 kN at A(free end),,Q=4 kN at D (1.5 m from B) and a couple of moment M =2kN-m at C (2.5 m from B) acting on a cantilever beam AB (length 3 m) which is fixed at B . Determine the resultant force acting on the beam and an equivalent system at B.

11. i) Two blocks of weights W_1 and W_2 are connected by a bar of negligible weight and rests on inclined plane having inclination angle $\alpha = 30°$ as shown in figure . Find the acceleration of the system and induced force in the bar when the system slides down the plane. The following data are given W_1=50 N, W_2=100 N, μ_1=0.1, μ_2=0.2. 10

basic stress





ii) Define coefficient of friction. How is it related to angle of friction? 2

12. i) A particle of weight W moves rectilinearly under the action of a force X=Psinwt. Derive the general displacement time equation assuming x_0=0 and $\dot{x}_0$=0 6

ii) State D'Alembert's principle. 3

iii) Explain terms amplitude, period, frequency and circle of reference. 4

$\frac{\pi r^2}{4}$

$\frac{\text{Area}}{\frac{\pi r^2}{4}}$ $\frac{x}{\frac{4r}{3\pi}}$ $\frac{y}{\frac{4r}{3\pi}}$

The bending stress

max. " "

Shear stress

max " "

$\frac{r^3}{3} \times \frac{4}{\pi r^2}$

$32.68 - 10.20a + 5.10a = 20.67$

$T = 32.68 - 10.20a$

$= 32.68 - 23.97$

$+5.1a = +12.01$

$a = 2.35$

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/CIVIL/PC-CE301/2022-23

2022

SURVEYING & GEOMATICS

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. Discuss about tacheometric constants ? 2
2. What do you mean by eye object correction 2
3. Define importance of base line in triangulation work. 2
4. Differentiate Crab and Drift 2
5. Write down basic principles of Remote sensing 2

GROUP-B
[LONG TYPE QUESTIONS]

Answer ***any four*** questions from the following 5x2=10

6. a) How do you determine the height of a hill ? Obtain an expression for the difference in level between two points by reciprocal vertical angle readings from two stations . 2+8
   b) The following measurements were made in a closed traverse ABCD: 5
   AB= 97.54m ; CD=170.69m; AD=248.47m; ∠DAB=70°45′ ; ∠ADC=39° 15′
   Calculate the missing measurements
7. a) The following readings were taken with a level and a 4 m staff. 8
   0.683,1.109,1.838,3.399,(3.877 and 0.451) C.P., 1.405,1.896,2.676 B.M.(31.126 A.O.D.), 3.478,(3.999 and 1.834) C.P., 0.649,1.706
   Draw up a level book page and reduce the levels by ***Rise and Fall method***
   Apply normal checks.
   b) Determine the R.L of an elevated tower at C from the following observations taken from two stations A and B, 50 m apart. Angle BAC =60° and angle ABC=50° . Angle of elevation from A to the top of tower =30° Angle of elevation from B to the top of tower = 29° 7
   Staff reading from A on bench mark of reduced level 25.00=2.500m
   Staff reading from B on the same bench mark =0.500m
8. a) Describe the principle/theory of stadia method 3
   b) Deduce the expression D=100S, where D and S have their usual meaning in the theory of Anallatic lens 5
   c) Define the term 'local attraction' & 'closing error' ? 2
   d) To determine the gradient between two points A and B ,A tacheometer is set up at another station C and the following observations are taken keeping the staff normal to the line of sight. 5

Staff at	Vertical angle	Staff Readins
A	4° 20′ 00″	1.300,1.610,1.920
B	0° 10′ 40″	1.100,1.410,1.720

If the horizontal angle ABC =35° 20′ : Determine the average gradient between A and B take additive constant =0 and multiplying constant =100

9. a) The details given below refer to the measurement of the first 30m bay of a base line. Determine the correct length of the bay reduced to mean sea level. 10
   With the tape hanging in catenary at a tension of 95 N and at a mean temperature of 13°C the recorded length was 29.9821m.The difference in height between the ends was 0.40 m and the site was 500 m above m.s.l.
   The tape had previously been standardized in a catenary at a tension of 70 N and at a temperature of 15°C and the distance between the zeros was 29.9965m. Take the following values : Radius of the earth =6367.3 km ; mass of tape =0.0191 kg/m; sectional area of tape =3.63 mm^2 ; E= 2.1x10^5 N/mm^4 ; and temperature coefficient of expansion of tape =12x10^{-6} per °C .

b) What are the different methods employed in tacheometric survey? Describe the method most commonly used. 5

10. Write short notes (any three) 3x5=15
    (a) Aerial camera
    (b) Reconnaissance
    (c) Total Station
    (d) Axis Signal Correction
    (e) Three point problem
    (f) Flight Planning

height diff
optical system
large area
cutting

large focusing
High magnifying

11. a) Write down the basic radiation laws 5

b) Write a note on various types of sensors used for remote sensing in India. 5

c) Two objects A and B whose elevations are 500m and 1500m respectively above m.s.l. are photographed from certain height with the axis of the camera vertical. The coordinates expressed in mm of the corresponding photo images a and b are : 5

Point	x-coordinate	y-coordinate
a	+200	+150
b	-320	-300

The focal length =200 mm and length AB=44227 m .
Find the height of camera station.

12. a) What do you understand by remote sensing ??? Differentiate between active and passive remote sensing. 5

(b) Explain ,with the help of a neat sketch, an idealized remote sensing system 5

(c) What are 4 M's for which geographic information is used? Elaborate 5

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use a part of e.m spectrum to records e.m energy reflected or emitted by the earth surface.