JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- December, 2019

M.Tech. I[st] Semester

COURSE CODE: 10M11CE115 MAX. MARKS: 35

COURSE NAME: Mechanical and Electrical Systems in Building

COURSE CREDITS: 03 MAX. TIME: 2Hrs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. The Psychrometric chart is given at the back of the question paper as Fig. 1.

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[1] Define the following terms: **[10]**

a) Annual fuel utilization efficiency (AFUE)
b) Coefficient of performance (COP)
c) Energy efficiency ratio (EER)
d) Integrated part load value (IPLV)
e) Seasonal energy efficiency ratio (SEER)

[2] With the help of diagrams, explain the three variations of night roof spray thermal storage system (NRSTS). **[4]**

[3] Find the total heat to be removed, and thus the refrigeration capacity (in ton) required, for a dance hall. The design conditions are: **[6+2 = 8]**

Room conditions (summer): 75°F DB (24°C), 50% RH
Number of occupants: 80 people
Activity: Dancing
Ventilation provided: 35 cfm (18 L/s) per person
Conditions for outdoor air: 90°F DB (32.2°C), 75°F WB (23.9°C)
Sensible Heat for 80 people: 305 Btu/hr
Latent Heat for 80 people: 545 Btu/hr
Supply air temperature: 20F°

[4] With the help of a schematic diagram, explain all-water HVAC system. **[3]**

[5] An insulated wall is constructed of 11 mm hardboard lapped siding (R = 0.060 °C. m^2/W), 19 mm extruded polystyrene insulation board sheathing (R = 0.528 °C. m^2/W), 89 mm fiberglass batt insulation (k = 0.046 W/°C. m^2), a vapor retarder (plastic film), and 13 mm gypsum board (R = 0.079 °C. m^2/W). Outside air film, 24 km/hr wind (R = 0.03 °C. m^2/W). Inside air film (for vertical surface, horizontal flow) (R = 0.12 °C. m^2/W). Determine the temperatures at the surfaces of each material in the construction assembly based on an outside air temperature of − 10°C and an inside air temperature of 21°C (winter conditions). **[6]**

[6] Determine the radiation component of heat transfer between an uninsulated wall cavity with a gypsum wallboard surface (ε = 0.9) and a rough plywood surface (ε = 0.9) on the sheathing

enclosing the wall cavity. Assume surface temperatures of 60° and 20°F and an area of 1.0 ft^2. [4]

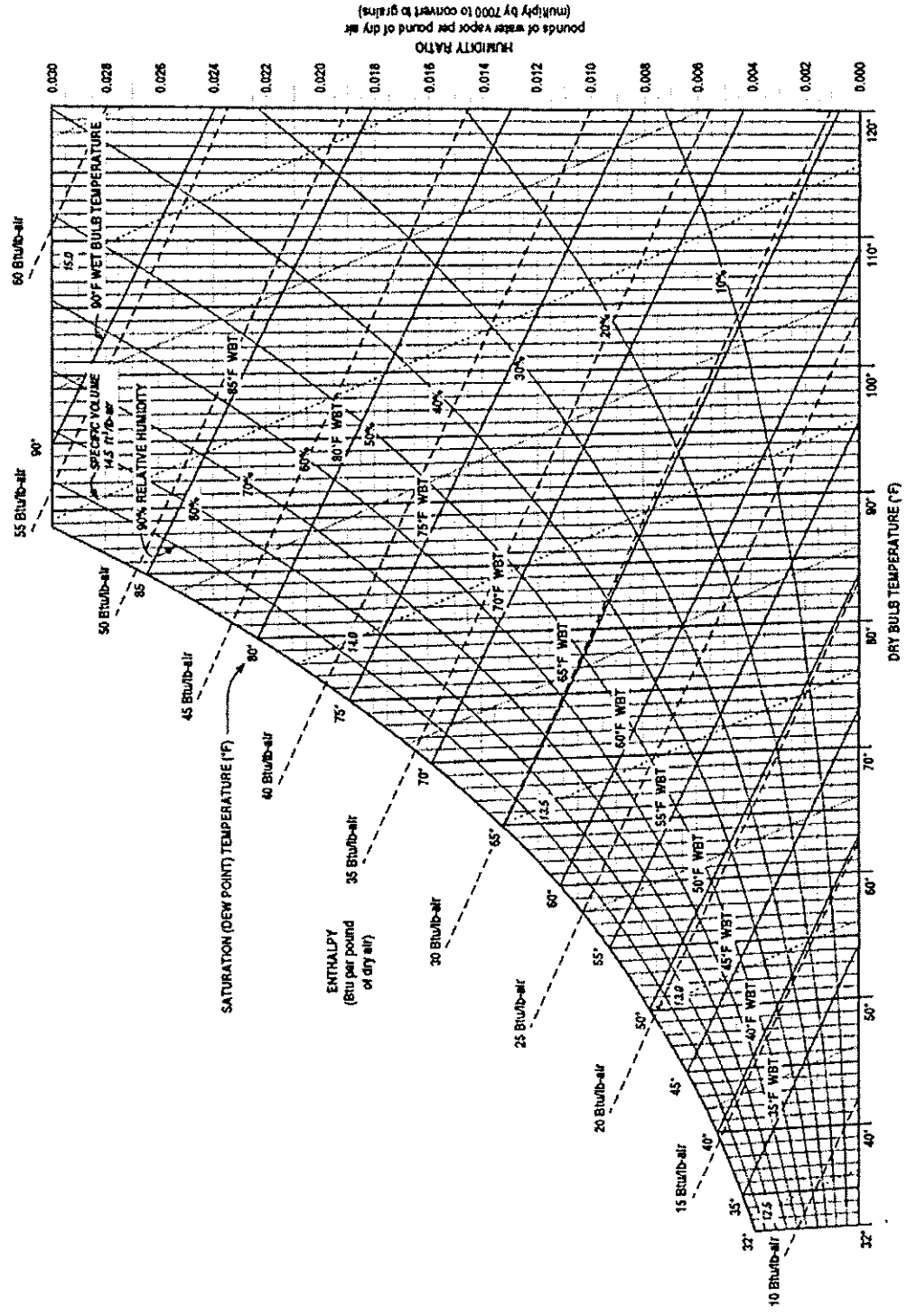


Fig.1 Psychrometric Chart

Kaushal Kr.

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION- Oct 2019
M-Tech(CM) 1st Semester

COURSE CODE: 10M11CE112 MAX. MARKS:35
COURSE NAME: Estimation and Costing
COURSE CREDITS: 3 MAX. TIME: 2 Hr

Note: *All questions are compulsory. Carrying of mobile phone or sharing of materials during examinations will be treated as case of unfair means.*

Q 1. Define Estimating? Method of Estimation? Explain with examples? **[4 Marks]**

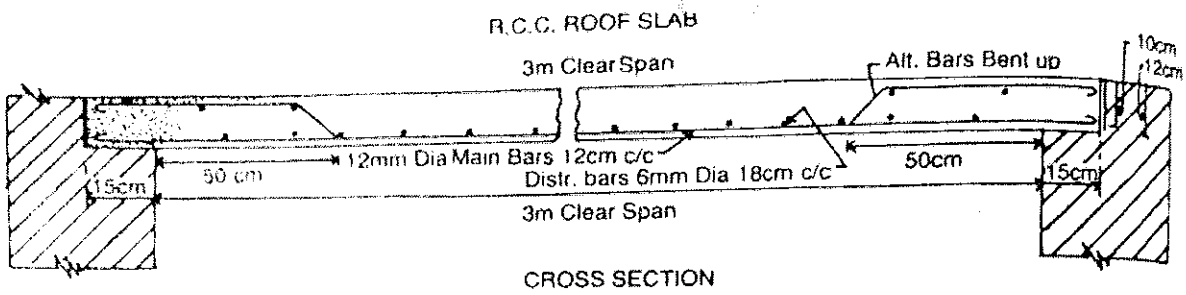
Q 2. The formation width of a road embankment is 9.0m. The side slopes are 2.5:1. The depths along the centre line of road at 50.0m intervals are 1.2, 1.1, 1.4, 1.2, 0.9, 1.5 and 1.0.m. It is required to calculate the quantity of earthwork by

(a) Prismoidal rule.

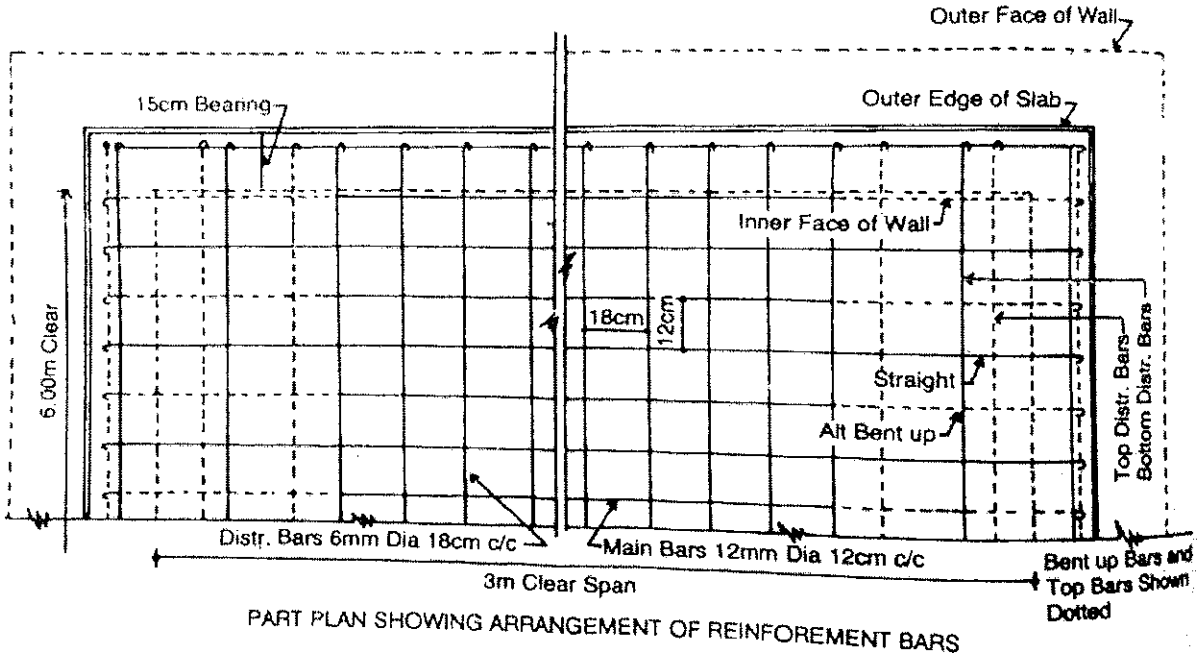
(b) Trapezoidal rule. **[3+3 = 6 Marks]**

Q3. Prepare the detail estimate of R.C.C roof slab of clear span 3 meters and 6 meters long as given in the figure below. RCC work including Centering and Shuttering and steel reinforcement in detail shall be taken separately. Also Prepare a Schedule for the bars.

[5+10 = 15 Marks]



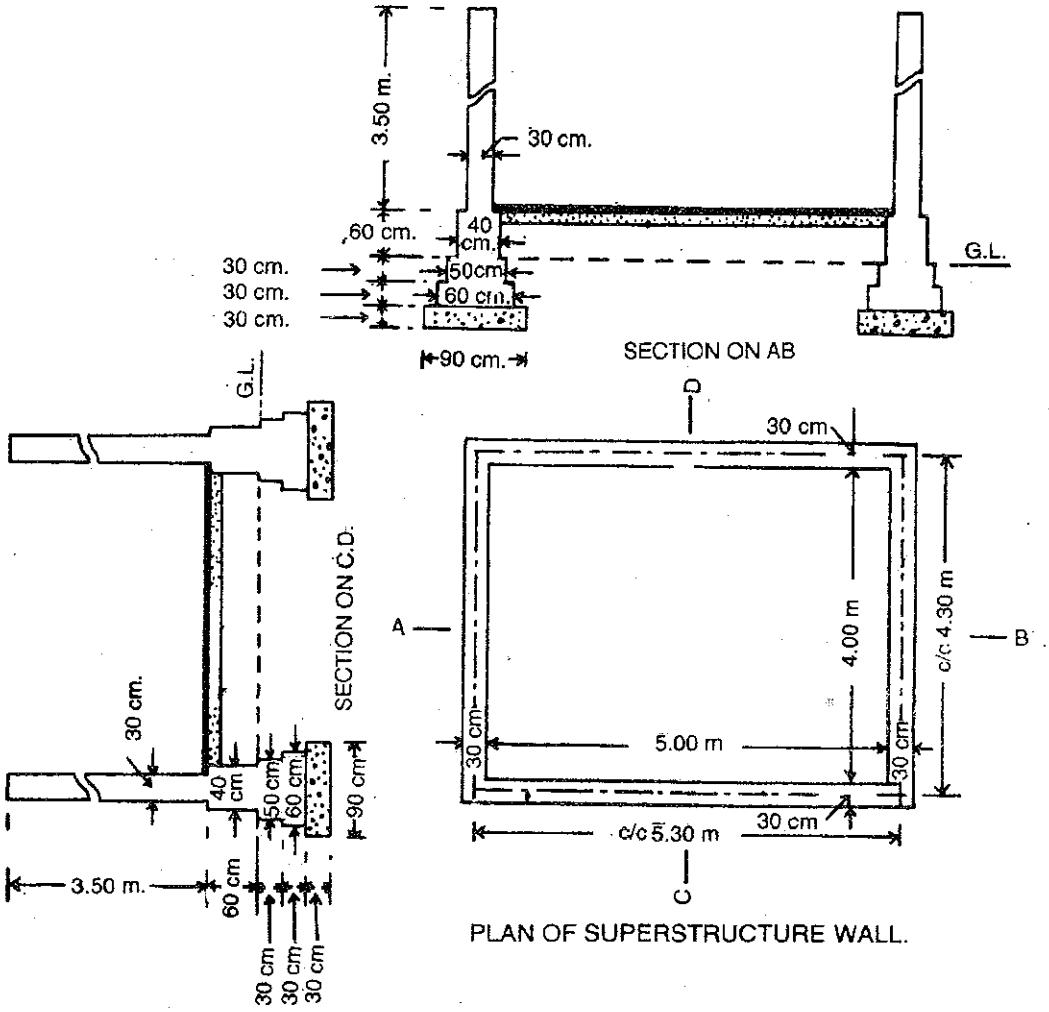
CROSS SECTION



PART PLAN SHOWING ARRANGEMENT OF REINFOREMENT BARS

Q 4. The plan represents the plan of a superstructure wall of a single room building of 5m x 4m, and Section represents the cross section of walls with foundation. Estimate the cost of quantities of -

a) Earthwork in excavation in foundation **b)** Concrete in foundation **c)** brickwork in foundation and plinth **d)** Brickwork in superstructure **[2.5*4 = 10 Marks]**



Cost of Earthwork per cubic centimeter – Rs. 01.00
Cost of laying concrete in foundation per cubic centimeter – Rs. 04.00
Brick work in foundation per brick – Rs 02.50
Brick work in superstructure per brick – Rs 03.00

-------End------

Dr. Pankaj

Jaypee University of Information Technology, Waknaghat

T 3 Examination – December 2019

M. Tech. 1st Semester (Structural Engineering) & B. Tech. 7th Semester (Civil Engineering)

Course Code: *13M1WCE131* Max. Marks: 35
Course Name: *Finite Element Methods*
Course Credit: *03* Max. Time: 120 *Minutes*

Note: All questions are compulsory. Carrying of mobile phone during examination will be treated as case of unfair means. Assume any missing data.

Q.1 Analyse the space truss shown in Figure1. The truss is composed of four nodes, whoses coordinates (in meters) are shown in figure, and three elements, whose cross-sectional areas are all 0.0002 m^2. The modulus of Elasticity E=200 GPa for all the elements. A load of 40,000 N is applied at node 1 in the global x-direction. Node 2-4 are pin supported and thus constrained from movement in the x, y and Z directions. [6]

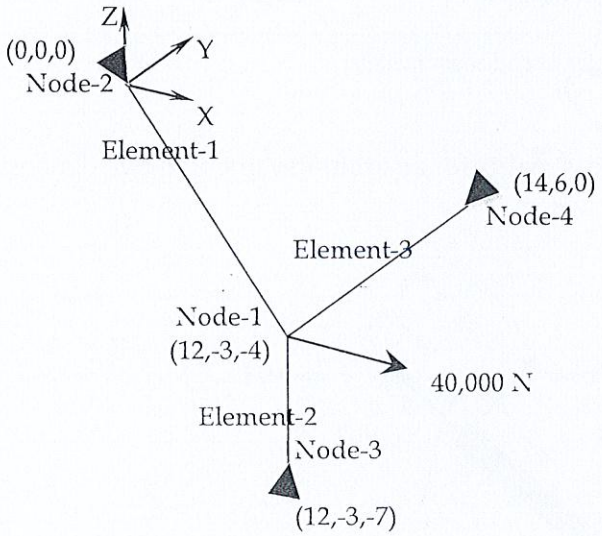
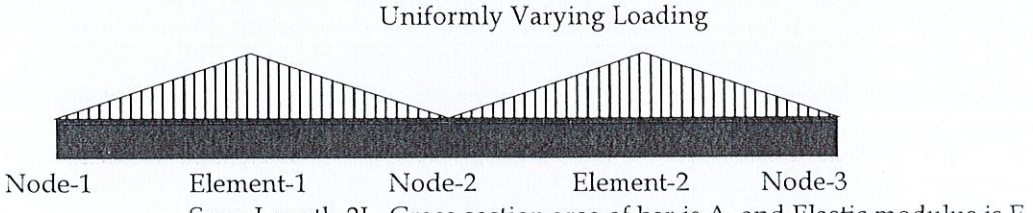


Figure 1: Space truss assembly

Q.2 Compare displacement and axial stress obtained from the finite element solution and exact solution for a bar element. (Assume minimum two elements in a bar element). The schematic view of bar element is shown in Figure 2. [7]



Span Length-2L, Cross section area of bar is A, and Elastic modulus is E.
Fixed at Node-1 and 2. (Assume suitable data if required).

Figure 2: Bar member subjected to uniformly varying loading

Q.3. (a) Write the statement for the Euler-Bernouli Beam Theory with the engineering application.

(b) Develop a beam stiffness matrix including bending deformation only.

(c) Plot the shape function for the same (beam). [2+3+3]

Q.4. Determine the displacement and rotation under the force and moment located at the centre of the beam shown in Figure 3. The beam has been discredited into the two elements, as shown in Figure. The beam is fixed at both ends. A downward force of 20 kN and an applied moment of 50 kN-m act at the centre of the beam. Elastic modulus E is 200 GPa and Moment of Inertia is 0.0005 m^4 throughout the beam length. Also plot the nodal forces and moments, which are acting on each element. [8]

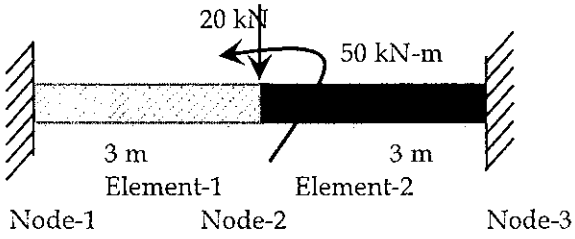


Figure 3: Fixed end beam member

Q.5 Develop a global elemental stiffness matrix for an arbitrarily oriented two dimensional beam element shown in Figure 4. [6]

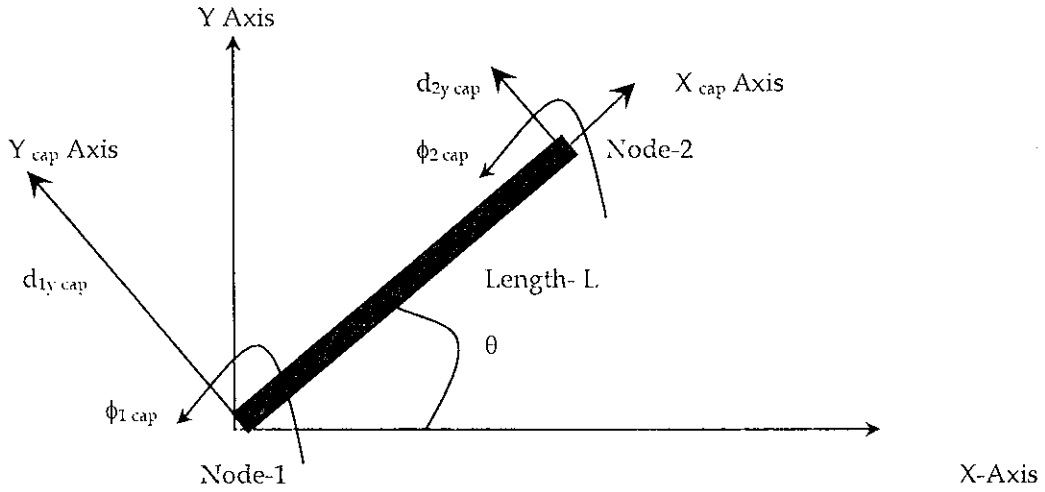


Figure 4: Arbitrarily oriented beam element

Dr. Ashok Gupta

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION

M.Tech. (CM) Ist Semester

COURSE CODE: 10M11CE111 MAX. MARKS: 35

COURSE NAME: Construction Techniques

COURSE CREDITS: 03 MAX. TIME: 2 Hours

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Q.1 For the following data design the formwork for slab and beam. (7 marks)

i. Slab thickness = 200 mm
ii. 12 mm plywood as the sheathing, 100 mm x 100 mm timber beams as secondary and primary beams are available
iii. Floor props CT as the staging.

Section properties of 100 mm x 100 mm timber

i. B = 100 mm
ii. D = 100 mm
iii. Area = 10000 m^3
iv. I = 8333300 mm^4
v. Z_{xx} = 166670 mm^3
vi. E = 7700 N/mm^2

Allowable stresses-
Allowable bending stress = 8 N/mm^2
Allowable shear stress = 0.6 N/mm^2
Bending moment capacity = 1.167 kNm
Shear force capacity = 8 kN
EI = 64.16 kNm^2

For 12 mm thickness plywood-
Permissible bending stress on 12 mm plywood = 14 N/mm^2. Permissible bending moment = 0.2 kN/m. Permissible shear force = 6.16 kN. Permissible deflection = span/360.

Q.2 Design formwork for the slab having thickness of decking 30 mm, concrete slab = 200 mm, live load = 5 kN/m^2 with 30% additional for impact and allowable stress in deck bending = 12 N/mm^2, shear = 0.8 N/mm^2 , E = 10000 N/mm^2, it is decided to use 100 mm x 100 mm batten as joist. (8 marks)
What is the spacing of the joist and what shall be the spacing of the stringer, clear span of the slab is 4m. Maximum permissible bending stress on the timber is 10 N/mm^2, shear = 0.5 N/mm^2, E = 10000 N/mm^2. Use 100 mm x 150 mm batten as the stringer.

Compressive strength normal to the grain = 2.75 N/mm^2. Compression parallel to the grain is 11 N/mm^2, E = 5000 N/mm^2. Permissible deflection in the sheathing is 1.6 mm.

Q.3 Design the formwork for a column of cross section 350 mm x 350 mm, and a height of 4 m. A plywood of 12 mm thickness is available. Permissible bending stress on 12 mm plywood = 14 N/mm^2. Permissible bending moment = 0.2 kN/m. Permissible shear force = 6.16 kN. Permissible deflection = span/360. (6 marks)

Assume two spans, with
Rate of rise = 2.5 m/h
Temperature of concrete = 20° C
$C_w \times C_c = 1$

Q.4 a) What are the different types of constructions related to fire resistive construction? Explain any two. (3 marks)

b) Explain any two fire equipments in detail. (2 marks)

c) For the data given below, compute the lateral pressure on formwork as per CIRIA formula and also draw the design pressure distribution. (3 marks)

D (weight density of concrete)	25 kN/m^3
C_1 (shape constant)	1
R, Rate of rise	1 m/h
C_2 , Concrete constituent factor	0.3
Temperature of concrete	30° C
Temperature co-efficient	0.9
H, Form height	6.15 m
H, pour height	6 m

Q.5 Design a wall formwork (all steel) for casting walls of 8 m height and 1 m thickness. The maximum lateral concrete pressure on the formwork can be assumed as 100 kN/m^2. Following materials are available: Mild steel plates of 4 mm thickness and mild steel flats of 60 mm x 6 mm and 80 mm x 6 mm are available. (6 marks)
Consider,
Maximum permissible bending stress in tension = 180 N/mm^2
K = 0.02720
For waler, Allowable bending moment = 10.8 kNm,
Allowable shear force = 110 kN
Allowable pull in tie rod = 45 kN
Assume any other required value.

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Chandel pal

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION

M.Tech. (SE) - Ist Semester

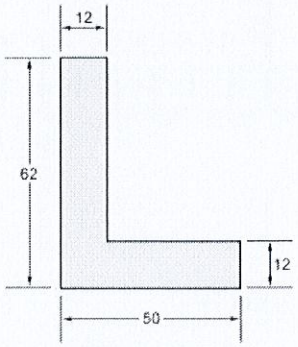
COURSE CODE: 11M1WCE111 MAX. MARKS: 35

COURSE NAME: Advanced Structure Analysis

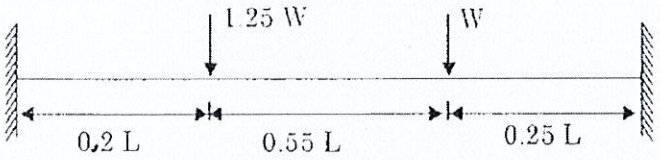
COURSE CREDITS: 03 MAX. TIME: 2 Hours

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

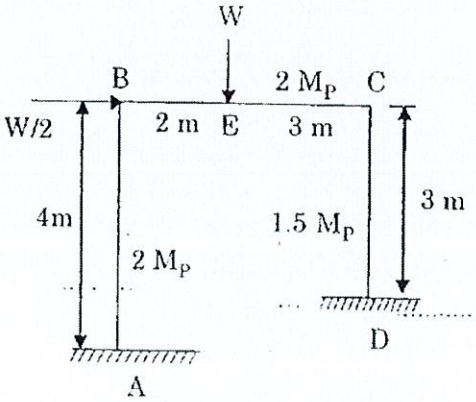
Q.1. Find the shape factor for the given section. All dimensions are in mm. **(6)**



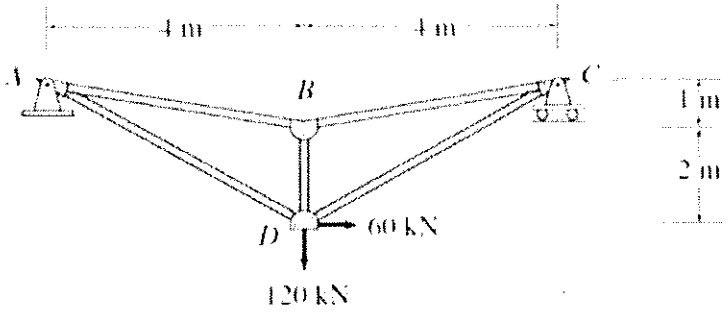
Q.2. Find the collapse load for the given beam. **(6)**



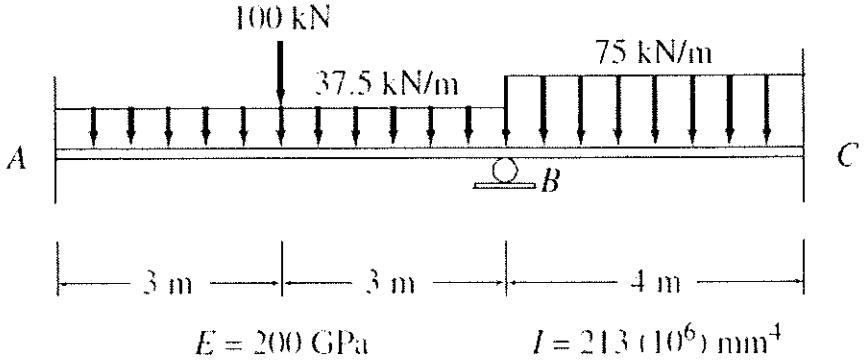
Q.3. Find the collapse load for the given frame. Plastic moment of each member is mentioned in figure. **(8)**



Q.4. Solve the given truss by using Matrix Method. **(8)**



Q.4. Solve the given beam by using Matrix Method. **(7)**



Dr. Pankaj Kumar

Jaypee University of Information Technology, Waknaghat

T 3 Examination – December 2019

M. Tech. 1st Semester (Structural Engineering) & B. Tech. 7th Semester (Civil Engineering)

Course Code: *11M1WCE112* Max. Marks: 35
Course Name: *Structural Dynamics*
Course Credit: *03* Max. Time: *120 Minutes*

Note: All questions are compulsory. Carrying of mobile phone during examination will be treated as case of unfair means. Assume any missing data.

Q.1 (a) Write a short note on Equivalent Stiffness of a structure. [2]

(b) Describe Free Vibrations of a structure and differentiate it from Forced Vibrations [3]

Q. 2 (a) What are the different types of Dynamic Loading? Categorize them on the basis of their sources. [2]

(b)Determine the natural frequency of a Single Degree of Freedom system having a weight of 10kN and a stiffness of 1000 N/mm^2. [3]

Q.3 Draw a graph showing the variation of displacement response of an undamped Single Degree of Freedom (SDoF) system with a mass 'm', and stiffness 'k' vibrating freely when subjected to an initial displacement of 'x0'. Formulate the necessary equations of response of the system. [5]

Q.4 Derive the Equation of motion of a Single Degree of Freedom (SDoF) system, subjected to an external force 'f(t)'

(a) using Newton's second law of motion. [2]

(b) using D' Alembert's Principle. [2]

Q.5 Discuss salient differences between under-damped, critically damped and over-damped systems. [3]

Q.6 A free vibration test is conducted on a Single Degree of Freedom System (SDoF) structure as shown in Figure 1 below. During the test, the roof of the system is displaced by 5 mm. After the instantaneous release of this initial displacement, the maximum displacement at the end of first complete cycle of oscillation was only 4mm and the period of this displacement cycle is T=1.4. Assuming that the weight (W) and stiffness (k) of the system are 87583 kg and 180kN/mm, respectively, determine:

(i) Force required to displace the mass by 5mm (Fo),

(ii). Un-damped frequency of vibration (ω), and

(iii). Damping Ratio (ξ). [4]

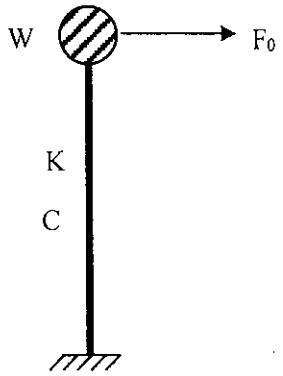


Figure 1: Schematic of a single degree of freedom system

Q. 8 calculate the vibration frequencies of the structure illustrated in Figure 2. The lateral story stiffness are 20 kN/mm, 18 kN/mm, and 22 kN/mm for 1st, 2nd, and 3rd story, respectively and mass are 200 kN for each storey. Also calculate the mode shape of the structure. Generalize the masses and stiffness corresponding to the mode shapes of the structure. [9]

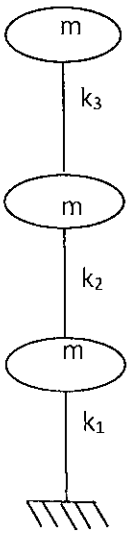


Figure 2: Three-story structure with three DOFs

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY,
WAKNAGHAT

Dr. Tanay Gupta

TEST – 3, DECEMBER 2019

MTech 1st Semester Structural Engineering

Course Code: 11M1WCE114 **Max. Marks:** 35
Course Name: Modelling, Simulation and Computer Applications **Max. Time:** 2 hr.
Course Credits: 03

Note: *All questions are compulsory. Marks are indicated against the questions. Carrying of mobile phone is strictly prohibited and will be treated as case of unfair means.*

Q.1 (a) What do you understand by terms "Modelling" and "Simulation"? Elaborate upon advantages and disadvantages of performing modelling and simulation. [4]

(b) Enumerate any 6 application of engineering applications of optimization. [1.5]

(c) Give any 6 classification for optimization problems. [1.5]

Q.2 Solve the following LPP by simplex method and write its Dual & find its solution

Minimize $-x_1 - 4x_2 - 3x_3$

subject to $2x_1 + 2x_2 + x_3 \leq 4$

$x_1 + 2x_2 + 2x_3 \leq 6$

$x_1 \geq 0,\ x_2 \geq 0,\ x_3 \geq 0$ [6]

Q.3 Solve by Dual Simplex Method

Minimize $3x_1 + 4x_2 + 5x_3$

subject to $x_1 + 2x_2 + 3x_3 \geq 5$

$2x_1 + 2x_2 + x_3 \geq 6$

$x_1 \geq 0,\ x_2 \geq 0,\ x_3 \geq 0$ [4]

Q.3 Solve the following transportation problem to find the optimum cost [5]

	1	2	3	4	Supply
1	5	9	-	4	28
2	6	10	3	-	32
3	4	2	5	7	60
Demand	48	29	40	33	

Q.4 A cooperative society of farmers has 50 hectares of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as Rs 10500 and 9000 respectively. To control weeds, a liquid herbicide must be used for crops X and Y at rates of 20 litres and 10 litres per hectare. Further, no more than 800 litres of herbicide should be used in order to protect fish and wildlife using a pond which collects drainage from this land. How much land should be allocated to each crop so as to maximise the total profit of the society? You may use graphical solution for the problem. [4]

Q.5 Four building companies have presented their projects to a competition called to build buildings A, B, C and D. Each builder must be assigned the construction of a building. The following tableau shows the time each building company needs to build each of the buildings. The objective is to assign the construction of a building to each building company so that the total building time is minimized. Find out the optimum assignment and cost. [5]

	1	2	3	4
A	58	58	60	54
B	66	70	70	78
C	106	104	100	95
D	52	54	64	54

Q.6 Consider the LPP [4]

$$\text{Maximize } 5x_1+2x_2+3x_3$$
$$\text{subject to } x_1+5x_2+2x_3 = 30$$
$$x_1-5x_2-6x_3 \leq 40$$
$$x_1 \geq 0,\ x_2 \geq 0,\ x_3 \geq 0$$

If the Primal objective row is given by where artificial x_4 and slack x_5 are the starting basic variables: $z+0x_1+23x_2+7x_3+(5+M)x_4+0x_5=150$

Write the associated dual problem and determine its optimal solution from optimal z equation.

Dr. Ashok

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION

M.Tech. (CM) Ist Semester

COURSE CODE: 10M11CE113 MAX. MARKS: 35

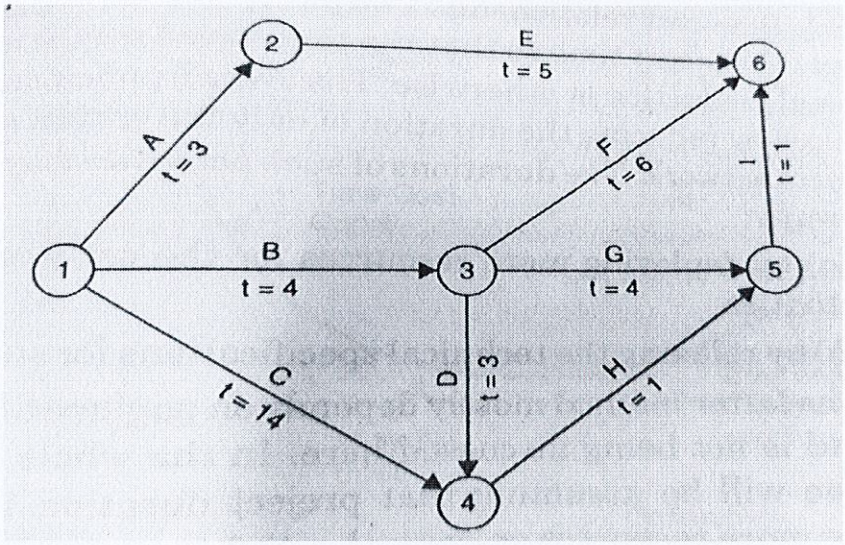
COURSE NAME: Construction Planning and Control

COURSE CREDITS: 03 MAX. TIME: 2 Hours

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Q.1 (a) What do you understand by updating? Why is it essential? (2 marks)

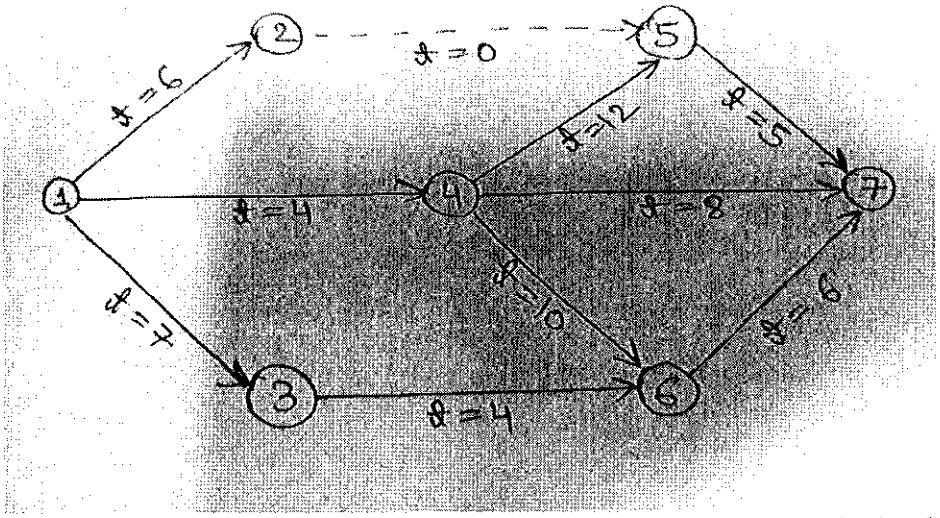
(b) The network shown in figure has the estimated duration foe each activity marked. Determine the total float for each activity and establish the critical path. Also determine free float and independent float for each activity. (8 marks)



Q.2 A network for a project is shown in figure below. The network is to be updated after 10 days of its execution. The following conditions exists at the end of 10 days – (8 marks)

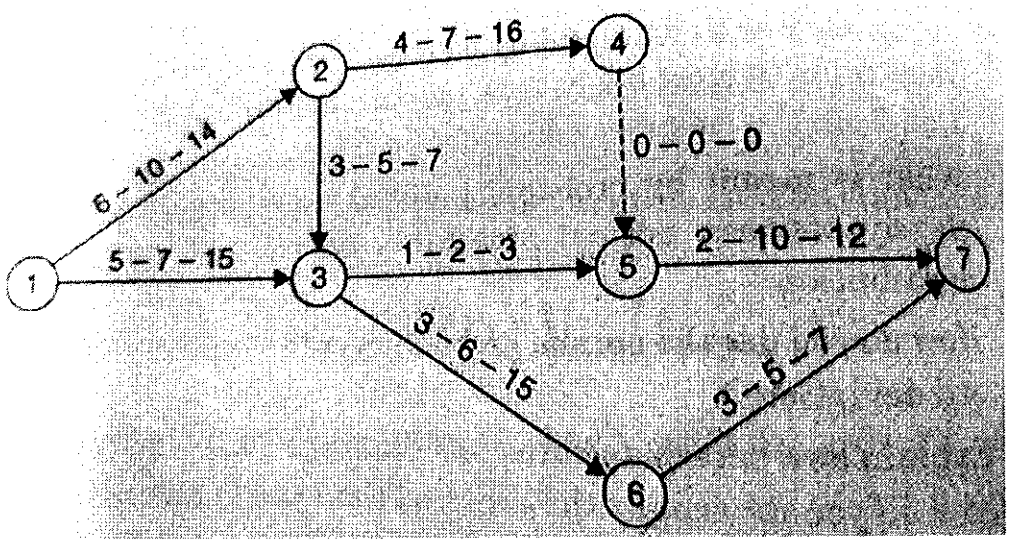
i. Activity 1-2, 1-3 and 1-4 have been completed as originally scheduled.
ii. Activity 4-5 is in progress and will require 6 more days for completion.
iii. Activity 4-6 is in progress and will require 6 more days for completion.
iv. Activity 3-6 is in progress and will be completed in one day.
v. Other activities have not been commenced and their original predicted durations will hold good, except for activity 5-7 which will require only three days instead of 54 days originally planned.

Update the network and determine critical path of updated network. What is the total increase in the project duration?



Q.3 a) Discuss in brief resources allocation problem. What are the methods of solving the problem? (2 marks)

b) The network for a certain project is shown in figure. Determine the expected time for each path. Which path is critical? (7 marks)



The project consists of eight events having predecessor relationship as under-

Event	Immediate Predecessor	Event	Immediate Predecessor
1	-	5	3,4
2	1	6	3,5
3	1	7	6
4	2,3	8	4,7

Q.4 For the network shown in figure, determine the slack for various events, if the scheduled date of completion of the project is 36 days. Present the computations in tabular form. (8 marks)