DR. KALAM POLYTECNIC COLLEGE, AVANAM

DEPARTMENT OF CIVIL ENGINEERING

SUB. NAME /CODE : 31041/THEORY OF STRUCTURES
YEAR/SEM : II/IV

UNIT- 1

PART A

1.Define elastic curve. (APR 2013)

2.Draw the deflected shape of the simply supported beam with central point load. (APR 2013)

3.Define stable structures. (APR 2013)

4.sketch the BMD due to prop for the propped cantilever with UDL throughout the length. (APR 2013)

5.Define flexural rigidity. (OCT 2013)

6.State Mohr's theorem II& I. (OCT 2013) (APR 2014) (APR 2015)

7.Give any two examples for statically intermediate structures. (OCT 2013)

8.Define the term prop. (OCT 2013) (APR 2014)

9.Define the term stiffness of beams. (OCT 2014)

10.What is the maximum deflection value of simply supported beam subjected to point load at mid span. (APR 2014) (OCT 2014)

11.State the degree of indeterminancy of a propped cantilever beam . (OCT 2014)

12.Name the different types of prop. (OCT 2014)

13.Draw the deflected shapes of any two beams. (APR 2015)

14.What do you mean by indeterminate structures? (APR 2015)

15.What will be the degree of indeterminancy of a propped cantilever with only vertical loads? (APR 2015)

PART B

1.A cantilever of 4 m span carries an udl of 20 kN/m run spread over its entire length. In addition to udl it carries an udl it carries concentrated loads of 30 kN at the free end.Calculate the slope and deflection at the free end by moment area method Take E= $2X10^5$ N/mm ^{2}and I= 8 X 10 ^{7}mm^4. (APR 2015)

2.A beam of length 6m is fixed at one end and supported on a rigid prop at the other end. The beam carries an udl of 10 kN/m over its entire length. Determine the prop reaction by area moment method.Draw SFD and BMD. (APR 2013) (APR 2015)

3.A cantilever beam of 5 m span carries an UDL of 15 kN/ m over a length of 3 m from the fixed end.Calculate the maximum slope and deflection at the free end by moment area method.Take EI=$6.75X10^4$ kN/m^2 (OCT 2014)

4. A propped cantilever beam of span 3m fixed at one end and propped at the other end carries a point load of 15 k N at a distance of 1m from the fixed end. Determine the prop reaction.Draw the SFD and BMD. (OCT 2014)

5.A cantilever of 4 m span subjected to an udl of 5 Kn/m. Find the maximum slope and deflection at the free end , if the flexural rigidity is 8x 10*4 kN/m*2. (OCT 2013)

6.A propped cantilever AB of 6 m span is propped at B.it is loaded with an udl of 10 kN/m over the right half of the span. Determine prop reaction by area moment method.Draw SFD and BMD. (OCT 2013)

7. A simply supported beam 5 m is 200 mm x 300 mm of size. It carries an udl of 5 k N/m over the entire span. Calculate the maximum slope and

deflection by areas moment method. Take E=1.2 X 10^5 N/ mm^2. (APR 2013)

8. A Steel pipe 50 mm internal diameter and 2.50 mm wall thickness is simply supported on a span of 6 m . If the deflection is limited to 1/325 of span , calculate the maximum slope at the supports.Take E = 2.10 X 10^5 N/ mm^2.(APR 2014)

9. A beam of length 4 m is fixed at one end and supported on a rigid prop at the other end. The beam carries an udl of 10 kN/m for a length of 2m from the fixed end. Determine the prop reaction and Draw SFD and BMD. (APR 2014)

UNIT – 2

PART A

1.What do you mean by 'μ' diagram? (APR 2013)

2.Mention any two advantages of fixed beams. .(april 2014& 2015) (APR 2013)

3.List various methods of analyzing intermediate structures. (APR 2013)

4.Calculate the value of $6a_1x_1/I_1$ for udl in theorem of three moments method. (APR 2013)

5.Define point of contra flexure.(april 2015) &(oct 2013)

6.Give the value of degree of indeterminancy of fixed beam.(april 2014)

7.Define continuous beam. .(april 2015)

8.State the Clapeyron's theorem of three moments .(april 2015)

9.Define the term fixed BMD? (oct 2014)

10.What is the maximum positive BM value of a fixed beam subjected to UDL throughout the span?(oct 2014)

11.Name any two general methods of analysis of indeterminate structures. (oct 2014)

12.State the theorem of three moments. (oct 2014)

13.What is the degree of indeterminancy of a two span continous beams with one end fixed and the other simply supported?(april 2014)

14.How do you consider fixed ends of continuous beams in theorem of three moments method? (april 2015)

PART B

1.A fixed beam of span 8 m is subjected to a concentrated load of 30 k N at its mid span.(i)Determine the fixed end moment by area moment method. (ii) Draw the SFD and BMD by marking values at salient points.(april 2013)

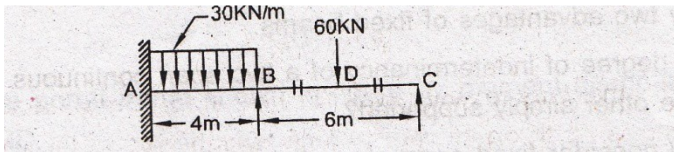
2.A continous beam ABC of uniform section with span AB as 8 m and BC as 6 m is fixed at A and simply supported at B and C.The beam is carrying an udl of 10 k N / m over the span AB and 5 k N/ m over the span BC.it also carries a point load of 20 k N at 2 m from the end C. Find the support moments using three moment equation.Draw the BMD and SFD.(april 2013)

3. A fixed beam of span 6 m carries an udl of 10 k N/ m over the entire span.calculate the fixed end moments. Draw the SFD and BMD .also mark the point of contra flexure. Use area moment method.((oct 2013)

4. A continous beam ABC is simply supported at A and C such that AB = 8 m and BC = 5 m.The span AB carries an udl of 20 k N / m and the span BC carries a point load of and 50 k N at its mid span .Find the support moments using three moment equation.Draw the BMD .(oct 2013)

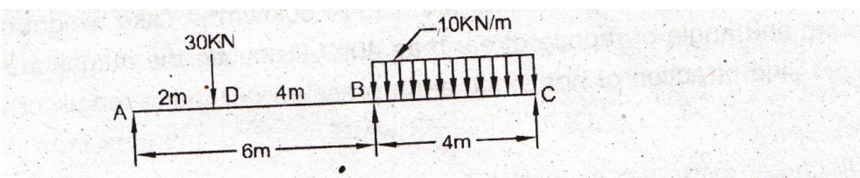
5.A fixed beam of span 5 m carries an UDL of 8 k N . calculate the fixed end moments and central deflection.Draw the BMD. Take EI = 1.25X 10*4 k N m*2.(april 2014)

6.Analyse the continuous beam shown in figure by the use of clapeyrons theorem of three moments.Draw the BMD .(april 2014)



7. A fixed beam of span 9 m is subjected to an UDL of 20 k N m over the entire length and two point loads of 15 k N each at 3m from the ends. calculate the fixed end moments .Draw the BMD indicating the maximum values. Take EI = 1.25X 10*4 k N m*2.(oct 2014)

8. Analyse the continuous beam shown in figure by the use of clapeyrons theorem of three moments.Draw the BMD .(oct 2014)



9. A fixed beam of span 8 m carries an udl of 45 k N / m over the entire span. It also carries two point loads of 150 k N each at 2 m from the ends. Calculate the support moments. Draw the BMD.(april 2015)

10. A continuous beam ABC of length 8 m has two equal spans.the span AB carries an udl of 20 k N / m over its entire length and span BC carries a point load of 20 k N at 3m from B. Draw the SFD and BMD. Take A and C as simple supports. Apply theorem of three moments method. (april 2015)

UNIT – 3

PART A

1.Define distribution factor.(april 2015) (oct 2014)

2.What is symmetrical portal frame? (april 2015) (april 2014)

3.What do you mean by non sway frame? (april 2015)

4.What is meant by substitute frame? (april 2015) (oct 2014) (april 2013)

5.State the sign conventions used in moment distribution method. (oct 2014)

6.Sketch a typical multi storey multi bay frame. (oct 2014)

7.Define the term carry over factor. (april 2014)

8.State the formula for stiffness factor of a member with one end fixed and the other end hinged. (april 2014)

9.Write the difference between sway and non-sway frames. (april 2014)

10.Define the term stiffness factor.(april 2013)

11.Define relative stiffness. (april 2013)

12.Sketch and mention the types of frames according to number of frames. (april 2013)

13.Define distribution moment.

14.What is carry over moment?

PART B

1.The Continuous beam of constant cross section and material is as shown in fig. compute the moments over the supports by moment distribution method. (april 2013)

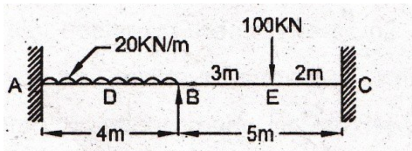
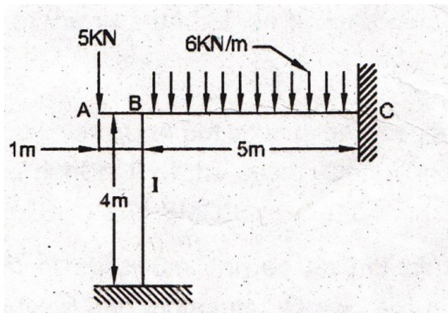
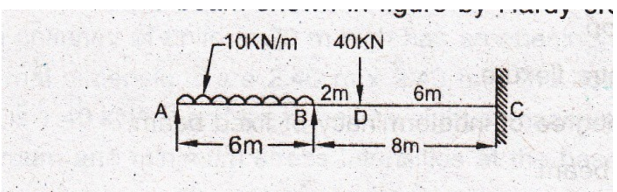


Fig.1

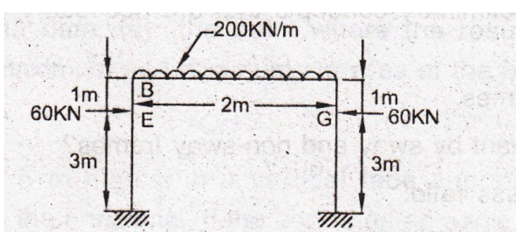
2.Analyse the frame shown in fig by moment distribution method and draw BMD. (april 2013)



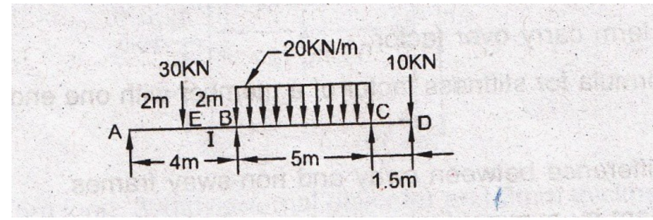
3.Analyse the continuous beam shown in fig by Hardy cross method. (OCT 2013)



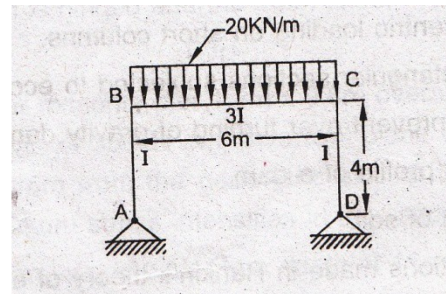
4.Analyse the portal frame shown in fig by moment distribution method and draw the BMD. (OCT 2013)



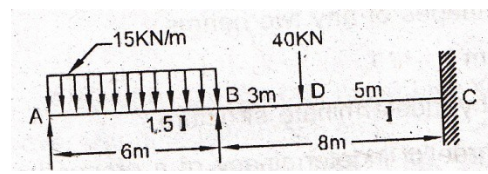
5.Analyse the continuous beam shown in fig by moment distribution method.Draw the BMD.(APR 2014)



6.Analyse the portal frame shown in fig by moment distribution method.Draw the BMD .(APR 2014)



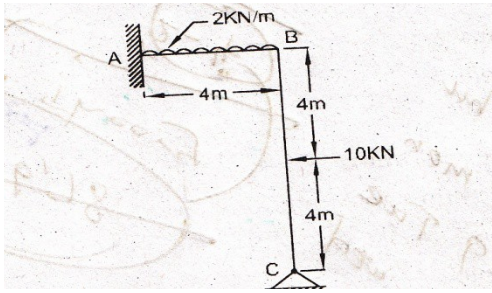
7.Analyse the continuous beam shown in fig by moment distribution method.Draw the BMD.(OCT 2014)



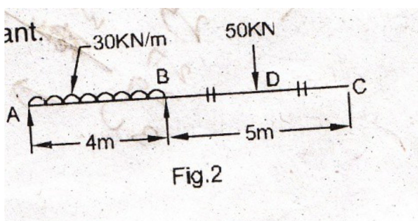
8.(i).State the sketch different types of substitute frames.

(ii).Briefly explain the procedure of analysis of a two bag substitute frames by moment distribution method.(OCT 2014)

9.Analyse the frame with the help of moment distribution method and draw the BMD. (APR2015)



10.Analyse the continuous beam shown in figure by moment distribution method.Draw the BMD. EI is constant.



UNIT – 4

PART A

1.Define the term equivalent length. (APR 2013)

2.Sketch the deflected shape of a long column with ends hinged and mark the effective length.(APR 2013)

3.Define a core or kern of a section? (APR 2013) (APR 2015)

4.Define eccentric loading.(APR 2013)

5.Define slenderness ratio.(OCT 2013)(APR 2015)

6.In what way the failure of column occurs? (OCT 2013)

7.Write the expression for finding maximum combined direct and bending stress. (OCT 2013)

8.Define resultant stress. (OCT 2013)

9.When do you call a column as long? (APR 2014)

10.What is the equivalent length of a column with one end fixed and the other hinged?(APR 2014)

11.State the effect of eccentric loading on short columns.(APR 2014)

12.Sketch the kern of rectangular sections subjected to eccentric loading. (APR 2014)

13.Write the formula for limiting slenderness ratio of long columns.(OCT 2014)

14.Define the term safe load on columns.(OCT 2014)

15.State middle third rule. (OCT 2014)

16.State the limit of eccentricity for circular sections.(OCT 2014)

17.What is meant by long column? (APR 2015)

18.Write Euler's formula. (APR 2015)

PART B

1.A steel tube 4.5 m long, 30mm external diameter and 3mm thickness is used as a strut. Calculate the Eulers crippling load for the following end condition (i) When both ends are hinged (ii) When one end is hinged and the other is fixed.Take E= $2X10^5 N/mm^2$.(APR 2015)

2.A short hollow cylindrical column has 300mm external diameter and 25 mm metal thickness. It carries a vertical load of 100 k N which is off the geometric axis by 20mm . Calculate the maximum and minimum normal stresses induced in the section.(APR 2015)

3.A steel column consists of two channels ISMC 400 at 49 N/ m placed back to back at a clear distance of 200 mm and used as column. Find the safe load on the column with a factor of safety of 3 by Rankines formula. the column is 4.5 m long fixed at one end hinged at the other end. Take σ_c = 320 N/ $mm^2$and a= 1/7500.The properties of each channel are, I_{XX}= 15082.8X10^4 mm^4,I_{YY}= 504.8X$10^4$$mm^4$, C_{YY}= 24.2 mm and A=6293 mm^2. (OCT 2014)

4.A cast iron hollow circular section has projecting bracket carrying a load of 100 k N .The load line is off the geometrical axis of the column is 250 mm and the thickness of metal is 25 mm.Determine the maximum and minimum stresses developed in the column.Also plot the variation of stress in the section. (OCT 2014)

5.A hollow cast iron column whose outside diameter is 250mm has a wall thickness of 25 mm. It is 4.5m long and fixed at both ends.Calculate i.) the slenderness ratio,ii.) safe road by Eulers formula with a factor of safety of 3, and iii.) safe load by Rankines formula with a factor of safety of 4. Take E= 2.1X10^5 N/ $mm^{2,}$ T_C= 320 N/mm^2, a= 1/1600.(APR 2014)

6. A masonry chimney of uniform circular section has internal and external diameters of 2 m and 2.5 m respectively. The height of the chimney is 15 m. It is subjected to a horizontal wind pressure of intensity 1.140 k N/ m^2. Calculate the maximum and minimum stress intensities at the base, if the specific weight of masonry is 20 k N/ m^3. (APR 2014)

7. A steel tube 4.5 m long, 30 mm external diameter and 3 mm thickness is used as a strut. Calculate the Eulers crippling load for the following end condition.i).When both ends are hinged ii)When one end is hinged and the other fixed. Take E= 2X 10^5 N / mm^2.(OCT 2013)

8.A hollow rectangular masonry pier 1.2 m x 0.8 m overall and 0.10 m wall thickness carries a vertical load of 300 k N in the vertical plane bisecting 1.2 m side and an eccentricity of 100 mm from the geometric axis of the section.Calculate the maximum and minimum stress intensities in the section. (OCT 2013)

9.A RSJ 300 mm x 140 mm and 5 m long is used as stanchion with one end fixed and the other free. Find the safe axial load for the stanchion using Rankines formula. Factor of safety is 3. For RSJ, I_{XX}= 8.6X $10^7$$mm^4$; I_{YY}= 4.54X10^6 mm^4; A = 5626 mm^2. Take a= 1/7500 and f_c= 330 N/ mm^2.(APR 2013)

10.A square chimney of uniform 20 m high has an opening of 1.2 mx 1.2 m inside.The external dimensions are 2.40 m X 2.40 m . The horizontal intensity of wind pressure is 1.40 k N / m^2 and the specific weight of masonry is 22 k N / m^3. Calculate the maximum and minimum stress intensities at the base of the chimney.(APR 2013)

UNIT – 5

PART A

1.Define basic cross section. (APR 2013)

2.What are the conditions of stability of a dam? (APR 2013)

3.Define angle of repose. (APR 2013) (APR 2014) (APR 2015)

4.What will be the coefficient of passive earth pressure of soil having angle of repose 40^0. (APR 2013)

5.What are the forces acting on the gravity dam? (OCT 2013)

6.Write the maximum and minimum stresses formula in the masonry. (OCT 2013)

7. Mention any two assumptions made in Rankine's theory of pressure. (OCT 2013)

8.What is state of equilibrium of soil? (OCT 2013)

9.State the condition to prevent over turning of gravity dams.(APR 2014)

10.Sketch the elementary profile of a dam. (APR 2014) (APR 2015)

11.What are the stresses developed at the base of a dam? (OCT 2014)

12. Mention any two modes of failure of masonry dams. (OCT 2014)

13.Name the forces that act an retaining wall. (OCT 2014) (APR 2015)

14.State the condition to prevent crushing of retaining wall at its base. (OCT 2014)

15.Name the forces that act on retaining walls. (APR 2015)

PART B

1.A trapezoidal masonry dam is 1.5 m width at top and 5m wide at the base. It is 8 m height with a vertical water face and retains water to a depth of 7.5 m. Find the maximum and minimum stress intensities at the base. Take weight of masonry as 22 k N / $m^3$and weight of water as 9.81 kN/ m^3. (APR 2015)

2.A trapezoidal masonry retaining wall 1.2 m wide at top and 3.6 m wide at the base is 6m high. The vertical, face retains earth up to the top with an angle of repose of soil as 30^0.Take weight of masonry as 23 k N/ m^3 and that of earth as 16 k N/ m^3. Check the stability of retaining wall for overturning and sliding, if μ= 0.60 and FOS =1.5 APR 15

3.A trapezoidal masonry dam 3m wide at top, 6m wide at the base is 15m high. It retains water to a depth of 14m on its vertical face.check the stability of the dam, If the weight of masonry and that of water are 22 k N/$m^3$and 9.81 k N/ m^3 respectively.Take the coefficient of friction between masonry and soil as 0.60 and fos as 1.50 .OCT 14

4.A retaining wall 2m wide at top ,4m wide at the base and 6m high retains earth to its full height on the vertical face. There is road on the top of retained earth as 18 k N/m^3.and angle of repose of soil as 40^0.Calculate the magnitude and the position of line of action of horizontal earth pressure per metre length of wall. OCT 14

5. A trapezoidal masonry dam is 1.25 m width at top and 7m high. The dam retains water on its vertical face with a freeboard of 1m. Calculate the necessary minimum base. Take weight of masonry as 22.50 k N / $m^3$and weight of water as 9.81 kN/ m^3.(APR 2014)

6 .A trapezoidal masonry retaining wall 1m wide at top and 3m wide at the base is 7.5 m high. It retains earth on its vertical face with the top of the wall. The angle of repose of soil as 35^0.Take weight of masonry as 22 k N/ m^3 andweight of earth as 18 k N/ m^3. Check the stability of retaining wall for overturning and sliding, if μ= 0.60 and FOS =1.5 APR 14

7.A masonry dam 20 m retains water to a depth of 18 m.The top width of the dam is 5m and bottom width is 15m .The relative density of masonry is 2.4. Calculate the normal stress intensities at the base of the dam. Sketch the stress distribution diagram.OCT 13

8.A retaining wall,6m high with a smooth vertical back retains earth level with the top of the wall.Determine the magnitude and line of action of the horizontal thrust per meter length of wall.The weight of sand is 20 k N/ $m^3$and its angle of repose is 400. OCT 13

9.A concrete dam of trapezoidal section of 15m height retains water on its full height . The top width of the dam is 3m and the bottom width is 8 m, weight of concrete is 24 k N/ m^3.Find i) the resultant thrust on the base per meter length of the dam,i) the point where the resultant cuts the base, iii) intensities of maximum and minimum stresses at the base. APR 13

10.A retaining wall 7.5 m high with a vertical face supports loose earth at a surcharge of 20^0 to the horizontal, if the earth has an angle of repose of 35^0 and has a specific weight of 16 k N/m^3. Calculate the earth pressure per meter length of wall by a Rankines formula. Calculate the horizontal and vertical components of the above earth pressure. APR 13