

Civil

Sub:- GE-I

Date: 18-12-13

18-11-13-DTP28-NK-7

Con. 8904-13.

LJ-11447

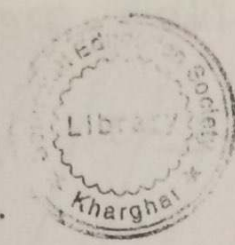
(3 Hours)

[Total Marks : 100]

- N.B. : (1) Question No. 1 is compulsory.  
 (2) Answer four out of remaining six.  
 (3) Assume suitable data wherever needed.



1. (a) Attempt any **four** of the following :- 5  
 Explain (i) Density index, (ii) Sensitivity, (iii) Degree of saturation, (iv) Flow index, (v) Consistency index.
- (b) One cubic meter of wet soil weights 19.8 KN. If the specific gravity of soil particles is 2.7 and water content is 11%, Find  $e$ ,  $r_d$ ,  $s$ . 5
- (c) Explain briefly uses of flownet. 5
- (d) Define placement water content and relative compaction. 5
- (e) Derive the expression for coefficient of permeability by variable head method. 5
- (f) Explain initial, primary and secondary consolidation. 5
2. (a) Derive the relation between  $r$ ,  $G$ ,  $e$  and  $S$  starting from basics. 5
- (b) A borrow material with an insitu dry unit weight of  $16 \text{ KN/m}^3$  is to be used in the construction of highway embankment. The wet unit weight of compacted soil in the embankment is  $19.6 \text{ KN/m}^3$  with a water content of 15%. Volume of embankment is  $50,000 \text{ m}^3$ . Calculate the volume of borrow material required. 10
- (c) Enlist the assumptions made in Terzaghi's one dimensional consolidation analysis. 5
3. (a) Define stokes law and describe briefly about wet sieve analysis. 7
- (b) Briefly explain the design features of sampler for getting undisturbed sample. 6
- (c) The liquid limit of clayey soil is 56% and plasticity index is 15%. 7
- (i) In what state of consistency this material at the water content of 45%.
- (ii) What is the plastic limit of soil.
- (iii) The void ratio of this soil if the minimum volume reached on shrinkage is 0.88. What is the shrinkage limit if its  $G = 2.71$ .



4. (a) A soil sample has  $W_L = 20\%$ ,  $W_P = 12\%$ .

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Steve size	% passing
2.032 mm	100
0.422 mm	85
0.075 mm	38

Classify the soil as per IS classification system.

- (b) A test well 0.5 m in diameter penetrates through a saturated aquifer 8 m thick overlying an impervious layer. A steady discharge of the well is  $18.72 \text{ m}^3/\text{hr}$ . The drawdown at a distance of  $R_1 = 15 \text{ m}$  from the centre of test well is found to be 1.8 m. What will be the drawdown at a distance of  $R_2 = 50 \text{ m}$ , if the permeability of soil is  $3.8 \times 10^{-4} \text{ m/s}$ ? Estimate approximate drawdown at the test well also.

10

- (c) Differentiate compaction and consolidation.

4

5. (a) A granular soil deposit is 7 m deep over an impermeable layer. The ground water table is 4 m below ground level. The deposit has a zone of compillary raise of 1.2 m with a saturation of 50%. Plot the variation of total stress, pore water pressure, and effective stress diagrams with  $e=0.6$ ,  $G = 2.65$ .

7

- (b) Define quick sand condition and derive the expression for critical hydraulic gradient.

6

- (c) At given location 8 m thick saturated clay  $W = 30\%$ ,  $G = 2.7$  is underline by sand. The sand layer is under artesian pressure equivalent to 3 m of water head. It is proposed to make an excavation in clay. How deep can this excavation be made before the bottom fails.

7

6. (a) The following observations were made in standard proctor test :-

6

Trial No.	1	2	3	4	5	6
Neight of wet soil (kg)	1.7	1.89	2.03	1.99	1.96	1.92
Water content (%)	7.7	11.5	14.6	17.5	19.7	21.2

Volume of mould 945 cc and  $G = 2.67$ .

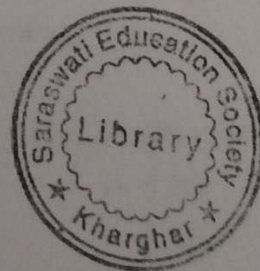


Determine the maximum dry density and optimum moisture content also plot 100% and 80% saturation lines.

- (b) Define :- (i) Coefficient of compressibility, (ii) Compression index, (iii) Over consolidation ratio (OCR). 6
- (c) A saturated soil has  $C_c = 0.27$ . Its void ratio at stress of  $125 \text{ KN/m}^2$  is 2.04 and its permeability is  $3.5 \times 10^{-8} \text{ cm/s}$ . Compute :- 8
- Change in void ratio if stress is increased to  $187.5 \text{ KN/m}^2$ .
  - Settlement if soil stratum is 5m thick.
  - Time required for 50% consolidation to occur if drainage is one way and  $T_v = 0.196$ .
7. (a) Explain the factors effecting shear strength of cohesionless soils. 5
- (b) The following results were obtained from CU test on normally consolidated clay plot the strength envelop in terms of total stress and effective stress and determine the strength parameters. 8

S.No.	Cell pressure	Deviator stress	Pore pressure
1.	250	152	120
2.	500	300	250
3.	750	455	350

- (c) Briefly describe standard penetration test for cohesionless soil along with corrections applied. 7



Civil

Sub: - TE-I

Date: 2/12/13

07-11-2013-DTP-P-8-KG-3

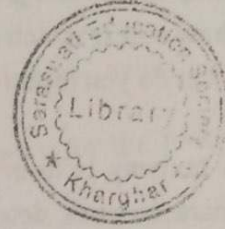
Con. 6897 - 13.

LJ-11326

(3 Hours)

[ Total Marks : 100

- N.B. : (1) Question 1 is compulsory.  
 (2) Attempt any four out of remaining six questions.  
 (3) Assume suitable data wherever necessary.



1. Solve any four :-
- (a) What is gauge ? What are the different types of gauges provided in India. 5  
 (b) Explain with sketch coning of wheel and tilting of rail. 5  
 (c) Draw and explain the wind rose diagram (any one type). 5  
 (d) Explain the various survey to be conducted for airport site selection. 5  
 (e) Draw a labelled neat sketch of an artificial harbour. 5
2. (a) Calculate all the necessary elements required to set out 1 in 8.5 turnout, taking of 10  
 from a straight B.G. track with its curve starting from the toe of the switch i.e.  
 tangential to the gauge face of the outer main rail and passes through theoretical  
 nose of crossings. Heel divergence (d) = 11.4 cms.  
 (b) What is meant by 'creep of rails.' Explain the wave action theory and percussion 6  
 theory of creep.  
 (c) Explain working of semaphore signals. 4
3. (a) A  $5^{\circ}$  branch curve diverge out from a  $2^{\circ}$  main curve in apposite direction of the 10  
 meter gauge track. If the speed is restricted to 30 km/hr on main line and cant  
 deficiency permissible is 5.1 cm what, would be the speed limit on branch line.  
 (b) What is meant by marshalling yard ? Draw the neat sketch of the typical marshalling 10  
 yard. Name the various parts. Also explain different types of marshalling yards.
4. (a) The length of a runway under standard condition is 2200 metres. The airport is to 10  
 be provided at elevation of 410 m above MSL. The airport reference temperature  
 is  $32^{\circ}\text{C}$ . The construction plan provides the following data :

End to end of runway in metres	Grade (Percent)
0 to 300	+ 1.00
300 to 900	- 0.50
900 to 1500	+ 0.50
1500 to 1800	+ 1.00
1800 to 2100	- 0.50
2100 to 2700	- 0.40
2700 to 3000	- 0.10

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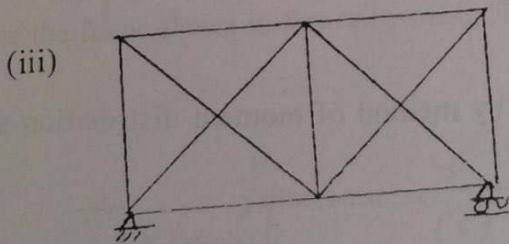
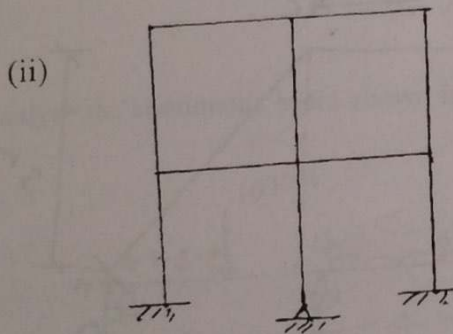
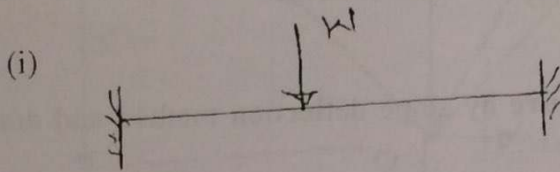


N.B. (1) Question No. 1 is compulsory.

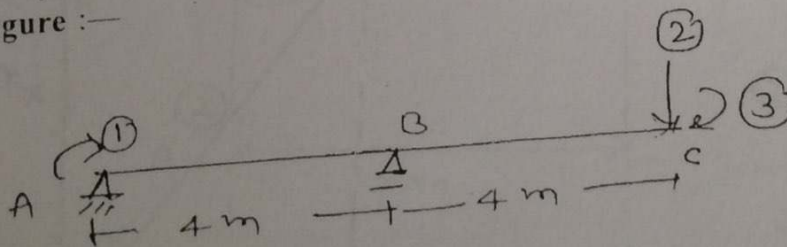
(2) Attempt any four out of remaining six questions.

(3) Assume any suitable data wherever required but justify the same.

1. (a) Determine the degree of static and kinematic indeterminacy for the following structure. Neglect the axial deformations. 6



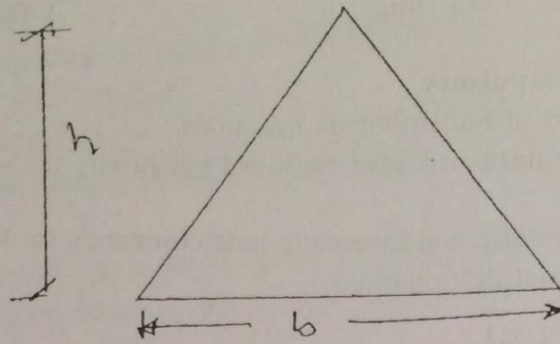
- (b) Develop the flexibility matrix for the beam with respect to the co-ordinates shown in figure:— 6



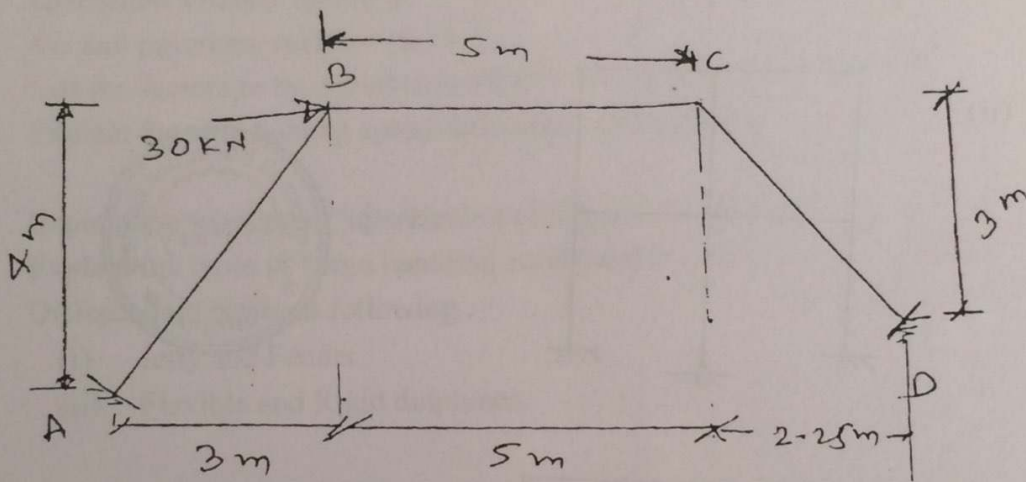
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Con. 8139-LJ-11245-13.

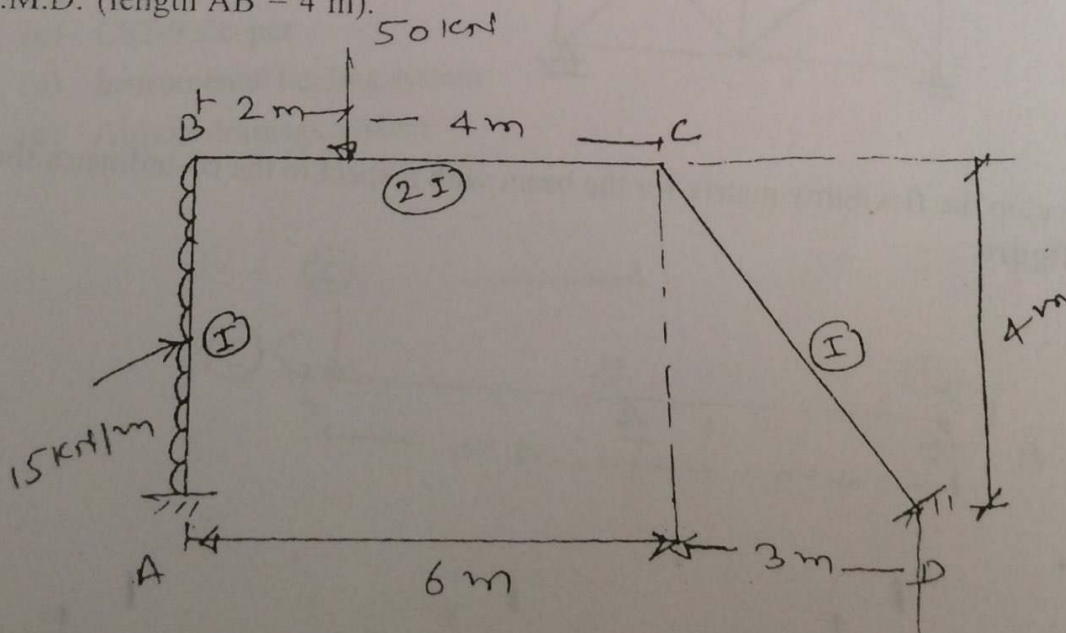
(c) Determine the shape factor for the triangular section as shown in figure :—



2. Analyse the structure shown in figure by slope deflection method and draw BMD 20 and deflected shape.



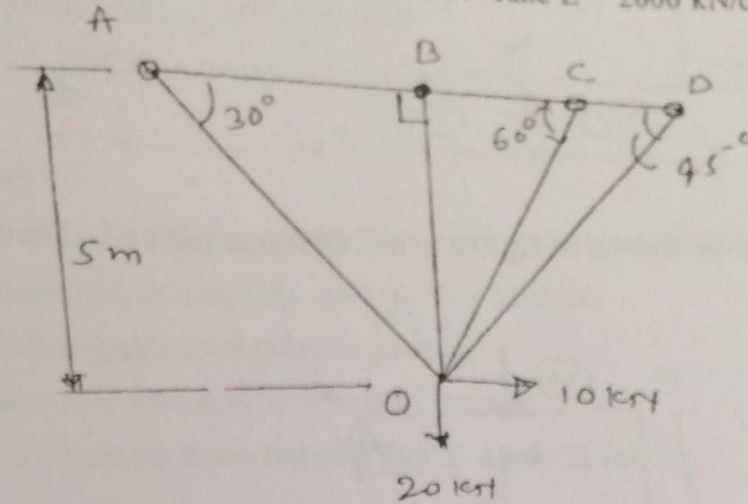
3. Analyse the frame as shown in figure by method of moment distribution and draw 20 B.M.D. (length AB = 4 m).



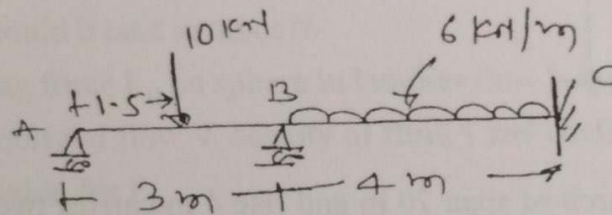


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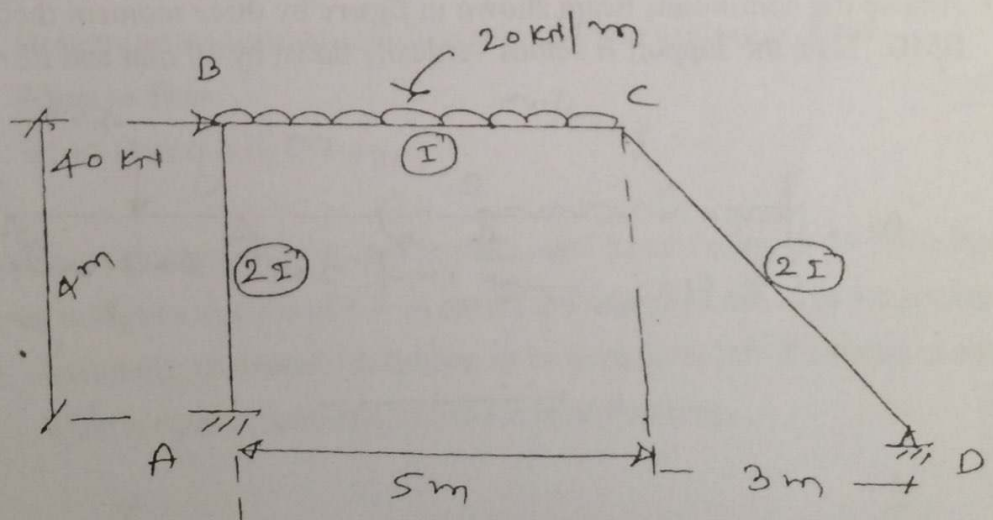
4. (a) Analyse the pin-jointed structure shown in figure by flexibility method the cross sectional area of each member is  $20 \text{ cm}^2$ . Take  $E = 2000 \text{ kN/cm}^2$ .



- (b) Analyse the continuous beam shown in figure by using Stiffness method.



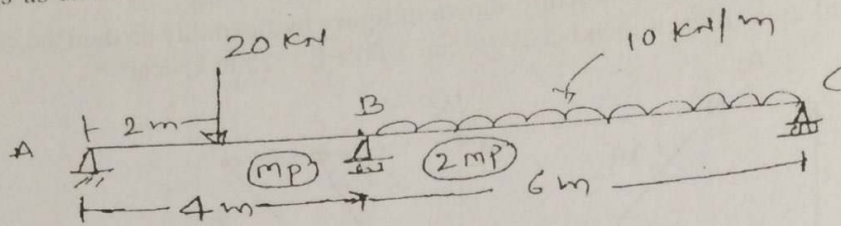
5. Analyse the frame shown in figure by using Force method and draw B.M.D.



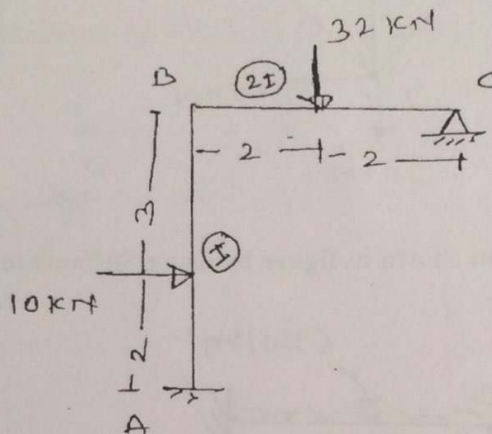
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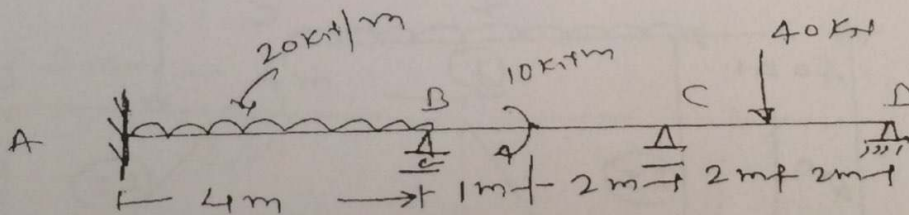
6. (a) Calculate the plastic moment capacity required for the continuous beam with working loads as shown in figure. 10



- (b) Analyse the frame as shown in figure using Stiffness method. Draw B.M.D. 10



7. (a) A two hinged parabolic arch of span 20 m and rise 4 m carries two point loads, each 30 kN, acting at 5 m and 10 m from the left end respectively the moment of inertia varies as the secant of slope. Determine the horizontal thrust and maximum positive and negative moments in the arch rib. 10
- (b) Analyse the continuous beam shown in figure by three moment theorem and draw BMD. Note the support B settles vertically down by 10 mm and  $EI = 1600 \text{ kN-m}^2$ . 10





(3 Hours)

[Total Marks : 100]

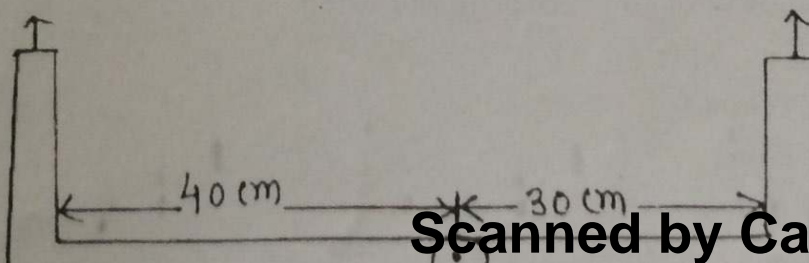
- N.B. : (1) Question no. 1 is compulsory.  
 (2) Solve any four questions from remaining questions.  
 (3) If required assume suitable data.

1. Solve any four :-

- (a) Write a note on Weber model law. Also write it's applications. 20  
 (b) Compare reaction turbine and impulse turbine.  
 (c) Explain impulse momentum equation.  
 (d) Write a note on specific speed of turbine.  
 (e) Write a note on distorted and undistorted models.



2. (a) A 1:50 spillway model has a discharge of  $1.25 \text{ m}^3/\text{s}$ . What is the corresponding prototype discharge? If flood phenomenon takes 12 hr to occur in prototype how long should it take in model? 10  
 (b) The drag force  $F_D$  on sphere in laminar flow is known to depend on it's diameter  $D$ , velocity of flow  $V$ , density of fluid  $\rho$  and coefficient of viscosity  $\mu$ . Obtain an expression for  $F_D$ . 10
3. (a) Bend in pipeline conveying water gradually reduces from 0.6 m to 0.3 m diameter and deflects flow through angle of  $60^\circ$ . At larger end the gauge pressure is  $171.675 \text{ kN/m}^2$ . Determine magnitude and direction of force exerted on bend. 10  
 (i) When no flow.  
 (ii) When flow is  $876 \text{ l/s}$ .
- (b) A sprinkler with unequal arms and jets of area  $0.8 \text{ cm}^2$  facing in the same direction is shown in figure. A flow of  $1.5 \text{ m}^3/\text{s}$  enters the assembly normal to the rotating arm. 10  
 (i) Assuming frictional resistance to be zero calculate it's speed of rotation.  
 (ii) What torque is required to hold it from rotating.



4. (a) A water available for a Pelton Wheel is  $4 \text{ m}^3/\text{s}$  and the total head from reservoir to nozzle is 250 m. The turbine has 2 runners with 2 jets per runner. All four jets have the same diameter. The pipeline is 3000 m long. The power of transmission through pipeline and nozzle is 91%. The velocity coefficient of each nozzle is 0.975 and coefficient of friction  $4f$  for pipe is 0.0045, determine :- 14
- Power delivered by turbine.
  - The diameter of jet.
  - Diameter of pipeline.
- (b) Write a note on Layout of Hydroelectric plant. 6
5. (a) A hub diameter of Kaplan turbine working under head of 12 m is 0.35 times diameter of runner. The turbine is running at 100 rpm. If Vane angle of the extreme edge of runner at outlet is  $15^\circ$  and flow ratio 0.6, find :- 10
- Diameter of runner
  - Diameter of boss.
  - Discharge through runner.
- (b) A turbine is to operate under a head of 20 m at 200 rpm. The discharge is 9 cumec. If the efficiency is 90%, determine the performance of the turbine under a head of 20 m. 10
6. (a) The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 rpm. The Vane angles of impeller at inlet and outlet are  $20^\circ$  and  $30^\circ$  respectively. The water enters impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. 10
- (b) A jet of water of 30 mm diameter moving with velocity of 15 m/s, strikes a hinged square plate of weight 245.25 N at centre of plate. The plate is uniform thickness. Find the angle through which plate will swing. 10
7. Write a short notes on :- 20
- Hydraulic Ram.
  - Hydraulic Crane.
  - Buckingham's  $\pi$  theorem.
  - Jet propulsion of ship.