

**University of Mumbai**  
**Examination 2020 under cluster KJSIEIT**

Program: T.E (Civil) Rev 2016 (Choice Based)

Curriculum Scheme: Rev 2016

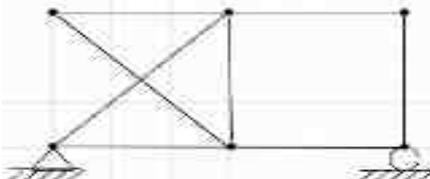
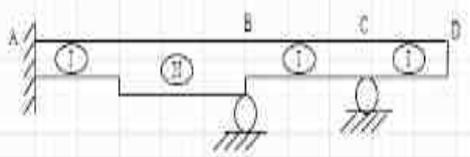
Examination: TE Semester: V

Course Code: CEC501 and Course Name: Structural Analysis II

Time: 2 hour

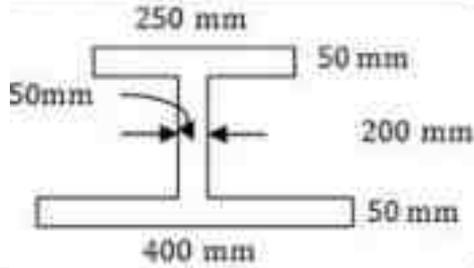
Max. Marks: 80

**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**

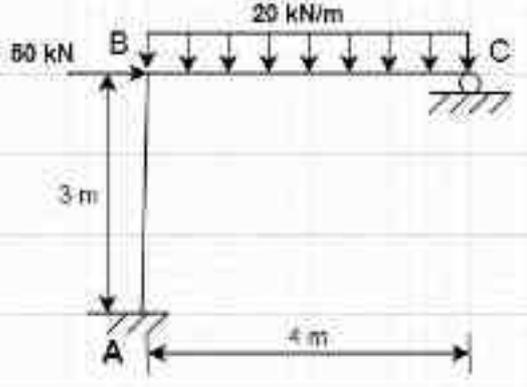
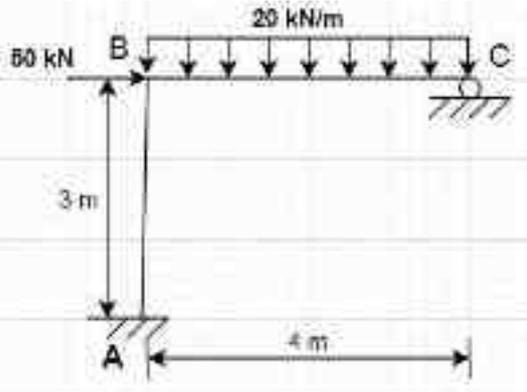
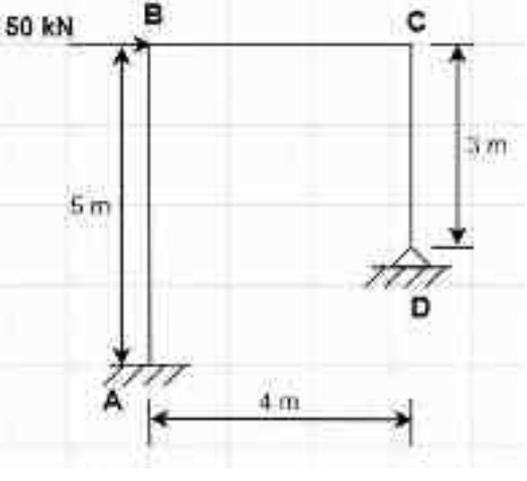
1.	Find if the given structure is stable or unstable and also calculate the Ds? 
Option A:	Ds = 0; Structure is internally unstable
Option B:	Ds = 0; Structure is unstable
Option C:	Ds = 0; Structure is stable
Option D:	Ds = 0; Structure is externally unstable
2.	Find the static and kinematic indeterminacy of the structure: 
Option A:	Ds = 2; Dk = 5
Option B:	Ds = 2; Dk = 6
Option C:	Ds = 2; Dk = 4
Option D:	Ds = 1; Dk = 6
3.	Two hinge parabolic arch of span L and rise h carries a concentrated load W from distance (a) from Left support . The moment of inertia of the arch rib varies as the secant of the slope of the rib axis. Horizontal thrust at support is
Option A:	$H = ( 5 W a (L-a) ( L^2 +La - a^2) ) / ( 8hL^3 )$
Option B:	$H = ( 4 W a (L-a) ( L^2 +La - a^2) ) / ( 8hL^3 )$
Option C:	$H = ( 5 W a (L-a) ( L^2 +La - a^2) ) / ( 6hL^3 )$
Option D:	$H = ( 5 W a (L+a) ( L^2 +La - a^2) ) / ( 8hL^3 )$
4.	A continuous beam 15 m long is simply supported at A, B and C, the supports being at the same level span AB is 8m long and carries UDL of 1.5KN/m and on BC is 7m long carries UDL 1KN/m. Calculate moment of area of BMD about A.
Option A:	256 kNm <sup>3</sup>
Option B:	512 kNm <sup>3</sup>
Option C:	260 kNm <sup>3</sup>
Option D:	250 kNm <sup>3</sup>

5.	A single bay, single storey portal frame has a hinged left support and fixed right support. It is loaded with udl on the beam. Which one of the following statement is true with regard to deformation of frame?
Option A:	It would sway to the left side
Option B:	It would sway to the right side
Option C:	It would not sway at all
Option D:	It would displace towards left
6.	A propped cantilever AB of span 5m, end A is fixed and end B is roller, 10 kN load is acting at 2m from A and 3m from B. Find Reaction at support A and B?
Option A:	$V_a = 7.92 \text{ kN}$ , $V_b = 2.08 \text{ kN}$
Option B:	$V_a = 8.2 \text{ kN}$ , $V_b = 3 \text{ kN}$
Option C:	$V_a = - 14.5 \text{ kN}$ , $V_b = 5 \text{ kN}$
Option D:	$V_a = - 7.92 \text{ kN}$ , $V_b = 2.08 \text{ kN}$
7.	A Fixed beam AB of span 6 meter whose both end fixed , load 20 kN is acting at the center of the span , support B sinks down by 30 mm with a value of EI is 2700 kN/m <sup>2</sup> . Find the final fixed end moments at supports A and B
Option A:	support A is - 28.5 kNm and support B is 2 kNm
Option B:	support A is - 2 kNm and support B is 28.5 kNm
Option C:	support A is - 28.5 kNm and support B is 28.5 kNm
Option D:	at support A is - 2 kNm and support B is 2 kNm
8.	A rigid jointed plane frame ABCD , member AB and CD are vertical with length 4 meter ,member BC is horizontal of length 4 meter , support A and D are fixed. 50 kN load in X direction is acting at joint B . A couple 100 kNm is acting at joint B in clock wise direction. A couple of 50 kNm is acting at joint C in clock-wise direction. Equilibrium equation at joint B is _____
Option A:	$-0.375 \Delta - 2EI\theta_b + 0.5 EI \theta_c = 100$
Option B:	$-0.375 \Delta - 2EI\theta_b + 0.5 EI \theta_c = 50$
Option C:	$-0.375 \Delta - 2EI\theta_b + 0.5 EI \theta_c = -100$
Option D:	$-0.375 \Delta - 3EI\theta_b + 0.5 EI \theta_c = 100$
9.	For rigid jointed plane frame ABCD, members AB and CD are vertical of length 4 meter. Member BC is horizontal of length 4 meter. Support A and D are fixed and EI is constant. Diagonal co-efficient of stiffness matrix is _____
Option A:	$24EI/16$ , $8EI/4$ , $8EI/4$
Option B:	$12EI/16$ , $8EI/4$ , $8EI/4$
Option C:	$24EI/16$ , $8EI/4$ , $4EI/4$
Option D:	$24EI/16$ , $4EI/4$ , $4EI/4$
10.	One bay double stored frame. The height of first storey is 4 meter and height of second storey is 3 meter with span of 6 meter. Member ABC and Member FED are vertical. Height of member AB and EF is 4 meter. Height of member BC and ED is 3 meter with moment of inertia of I. For member BE and CD of 6 meter with 2I is horizontal. The rotation factor for member EB ,ED and EF will be _____
Option A:	- 0.182 , -0.182 , -0.136
Option B:	- 0.136 , -0.182 , -0.136
Option C:	- 0.182 , -0.182 , -0.182
Option D:	- 0.182 , -0.136 , -0.182

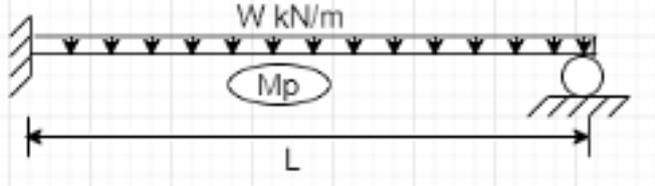
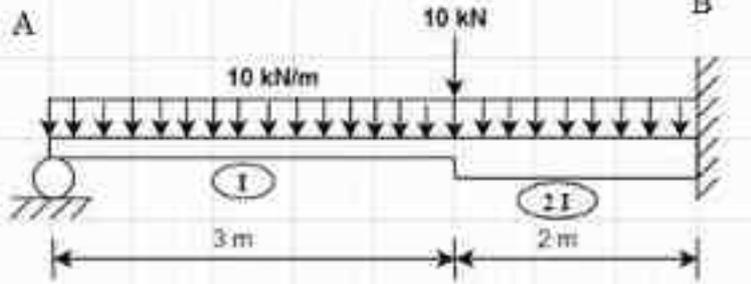
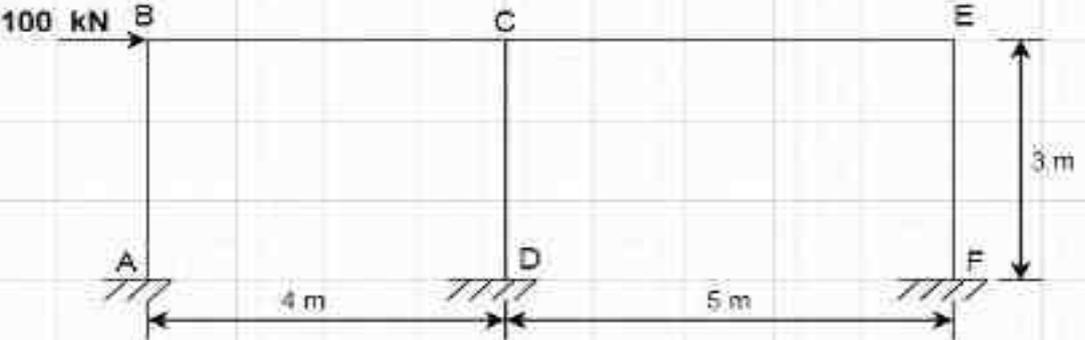
11.	For Cantilever beam of span 4 with action 1 is acting in downward direction at mid span ,second action is acting at free end in downward direction and third action couple in clockwise direction at free end Diagonal member of flexibility matrix is _____
Option A:	2.66/EI ,21.33/EI, 4/EI
Option B:	2.33/EI ,21.33/EI, 4/EI
Option C:	2.66/EI ,21.33/EI, 8/EI
Option D:	2.66/EI ,20.33/EI, 4/EI
12.	For fixed beam of span L carrying load w kN/m only on half span from left support to centre of span . Collapse load is _____
Option A:	$W_c = 28.57 Mp /L^2$
Option B:	$W_c = 11.65 Mp /L^2$
Option C:	$W_c = 28.57 Mp /L$
Option D:	$W_c = 11.65 Mp /L$
13.	A rigid jointed plane frame ABCD. Member AB and CD are vertical of height ( h ) . Member BC is horizontal of length L. Supports A and D are fixed. Horizontal load P is acting at B in x direction. What is Bending moment at supports by using Approximate method?
Option A:	Ph/4
Option B:	Ph/8
Option C:	Ph/6
Option D:	Ph/2
14.	For the rigid jointed frame subjected to temperature variations as shown in figure. Assume $\alpha = 12 \times 10^{-6} /^{\circ}C$ and depth of all members as 600mm. Neglect the effect of axial forces. The total deflection at 'C' is _____
Option A:	$\delta_c = 11.2 \text{ mm } (\downarrow)$
Option B:	$\delta_c = 55.5 \text{ mm } (\downarrow)$
Option C:	$\delta_c = 20.32 \text{ mm } (\downarrow)$
Option D:	$\delta_c = 18.67 \text{ mm } (\downarrow)$
15.	To generate the jth column of the flexibility matrix _____
Option A:	A unit force is applied at coordinate j and the displacement are calculated at all coordinates
Option B:	A unit displacement is applied at coordinate j and the forces are calculated at all coordinates
Option C:	A unit force is applied at coordinate j and the forces are calculated at all coordinates
Option D:	A unit displacement is applied at coordinate j and displacements are calculated at

	all coordinates
16.	Select the correct equation of static indeterminacy of plane frame structure:
Option A:	$D_s = (R-3) + 3C - \sum(m-1)$
Option B:	$D_s = (R-3) + 3C + \sum(m-1)$
Option C:	$D_s = (R-3) + 3C - 3\sum(m-1)$
Option D:	$D_s = (R-3) + 6C - \sum(m-1)$
17.	Equal Area Axis of the section shown from topmost fiber is at a distance: 
Option A:	210 mm
Option B:	250mm
Option C:	225 mm
Option D:	237.5 mm
18.	Shape Factor of diamond section is:
Option A:	1.5
Option B:	1.63
Option C:	2.63
Option D:	2
19.	Maximum positive Bending Moment of fixed beam carrying a point load W at mid span of length L will be:
Option A:	$WL/4$
Option B:	$WL/8$
Option C:	$WL/2$
Option D:	$WL/12$
20.	Kani's method of solving structural problem involves
Option A:	Rotation factor
Option B:	Distribution factor
Option C:	carry over factor
Option D:	Modified carry over factor

Q2	Solve any two out of three of 10 marks each
A	Find support reaction at support A and C by using Stiffness Method. Draw the bending moment diagram for the frame below.

	
B	<p>Find support reaction at support A and C by using Slope Deflection Method. Draw the bending moment diagram for the frame below.</p> 
C	<p>Find support reaction at support A and C by using Moment Distribution Method.</p> 

Q3.	Solve any Two Questions out of Three 10 marks each
A	Find the collapse load for the given beam.

	
B	<p>Find the support reaction at support by flexibility method.</p> 
C	<p>Draw the Bending Moment Diagram by Approximate Method.</p> 

**University of Mumbai**  
**Examination 2020 under cluster KJSIET**

Program: CIVIL ENGINEERING

Curriculum Scheme: Rev 2016

Examination: TE Semester V

Course Code: 502 and Course Name: Geotechnical Engineering I

Time: 2 hour

Max. Marks: 80

<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>	
1.	The group of transported soils formed by movement of soil from its original place by gravity is known as
Option A:	Glacial soils
Option B:	Colluvial soils
Option C:	Marine soils
Option D:	Lacustrine soils
2.	For well graded gravel
Option A:	$C_u > 4$ and $1 \leq C_c \leq 3$
Option B:	$C_u > 4$ and $0 \leq C_c \leq 3$
Option C:	$C_u > 6$ and $1 \leq C_c \leq 3$
Option D:	$C_u > 6$ and $0 \leq C_c \leq 3$
3.	Hydrometer reading is always corresponding to the upper level to meniscus therefore
Option A:	Meniscus correction is always negative
Option B:	Meniscus correction is always positive
Option C:	Meniscus correction is both negative and positive
Option D:	Meniscus correction is not considered
4.	A state when the decrease in moisture content leads to solid state of soil,
Option A:	Change in the volume of soil mass is observed
Option B:	Partial change in the volume of soil mass is observed.
Option C:	Complete change in the volume of the soil mass is observed
Option D:	No change in volume of soil mass is observed
5.	In a falling head permeability test the time taken for a head to fall from 27 cm to 3 cm is 10 minutes. If the test is repeated with same initial head what time would it take for the head to fall 9 cm?
Option A:	7.5 min
Option B:	3 min
Option C:	5 min
Option D:	6 min
6.	The saturated unit weight of sand in the bed of a pond 20 m deep is 20 kN/m <sup>3</sup> . Unit weight of water is 10 kN/m <sup>3</sup> . The effective stress at 4m below bed level of

	pond is
Option A:	40 kN/m <sup>2</sup>
Option B:	20 kN/m <sup>2</sup>
Option C:	60 kN/m <sup>2</sup>
Option D:	80 kN/m <sup>2</sup>
7.	A 30 cm well completely penetrates an unconfined aquifer of depth 40 m. After a long period of pumping at a steady rate of 150 lpm, the drawdown in two observation wells which are 25 m and 75 m from the pumping well were found to be 3.5 m and 2.0 m respectively. The draw down at the pumping well is.
Option A:	28.49 m
Option B:	11.51 m
Option C:	10.62 m
Option D:	12.34 m
8.	A sample of clay and a sample of sand have the same specific gravity and void ratio. Their permeabilities would differ because
Option A:	Their porosities would be different
Option B:	Their degree of saturation would be different
Option C:	Their densities would be different
Option D:	The size range of their void would be different
9.	To provide safety against piping failure with a factor of safety for a hydraulic structure what will be the maximum permissible exit gradient for soil with specific gravity and porosity of 0.4
Option A:	0.145
Option B:	0.16
Option C:	0.125
Option D:	0.21
10.	The in-situ void ratio of a granular soil deposit is 0.5. The maximum and minimum void ratios of the soil were determined to be 0.75 and 0.35. Specific gravity of solids is 2.67 the relative density of the soil is
Option A:	62.5 %
Option B:	89.9 %
Option C:	96.6%
Option D:	78.7 %
11.	A soil sampler has inner and outer radii of 25 mm and 30 mm respectively. The area ratio of the sampler is
Option A:	24 %
Option B:	34 %
Option C:	44 %
Option D:	54 %
12.	The method adopted for soil boring for depths greater than 3m and more is
Option A:	Seismic refraction method
Option B:	Percussion method
Option C:	Electrical resistivity method
Option D:	Sounding and penetration method

13.	During a sampling operation the drive sampler is advanced 600 mm and the length of the sample recovered is 525 mm. What is the recovery ratio of the sample.
Option A:	0.140
Option B:	0.125
Option C:	0.875
Option D:	0.143
14.	A sample of soil has following properties: Liquid limit = 45%, Plastic Limit = 25 %, Shrinkage limit = 17 %, and Natural moisture content = 30 %. The consistency index of the soil is
Option A:	$\frac{15}{20}$
Option B:	$\frac{12}{20}$
Option C:	$\frac{8}{20}$
Option D:	$\frac{5}{20}$
15.	A cohesive soil yields maximum dry density of 1.8gm/cc at an optimum moisture content of 16 %. If specific gravity of soil is 2.65 then determine the degree of saturation.
Option A:	80 %
Option B:	67 %
Option C:	71 %
Option D:	89 %
16.	The void ratio and specific gravity of a sample of clay are 0.75 and 2.7 respectively. The voids are 92 % saturated. Find the bulk density of the soil.
Option A:	1.65 gm/cc
Option B:	1.87 gm/cc
Option C:	1.94 gm/cc
Option D:	2.01 gm/cc
17.	Classify the soil for the given data: (a) Retained on 4.75 mm size sieve = 730 gm (b) Retained on 75 $\mu$ size sieve = 20 gm (c) Total mass of soil taken = 1000 gm (d) Liquid limit of soil = 40 % (e) Plastic limit of soil = 18 %
Option A:	GM
Option B:	GC
Option C:	SC
Option D:	SM
18.	Soil classification is done on the basis of
Option A:	Mechanical sieve analysis
Option B:	Grain size distribution and plasticity of soil
Option C:	Stokes law
Option D:	Dry sieve analysis and wet sieve analysis

19.	Among the clay minerals the one having the maximum swelling tendency is
Option A:	Kaolinite
Option B:	Illite
Option C:	Montmorillonite
Option D:	Halloysite
20.	Chemically combined water in the crystal structure of the soil mineral which can be removed only by breaking the crystalline structure is known as
Option A:	Capillary water
Option B:	Adsorbed water
Option C:	Hygroscopic water
Option D:	Structural water

<b>Q2.</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	What is capillary water? Discuss capillary rise in soil.	
B	An undisturbed soil sample has total weight of 2050 gm, volume of 1250 cc, water content = 10 % and specific gravity = 2.68. Compute (1) void ratio (2) porosity (3) degree of saturation (4) water content for fully saturated sample (5) effective unit weight of the soil sample.	
C	As per the compaction specification, a highway fill has to be compacted to 90% of Indian standard light compaction test dry density. A borrow pit available near the project site has a dry density of 1.78 gm/cc at 100 % compaction and a void ratio of 0.63. Compute the volume of borrow material needed to construct a highway fill of height 5m and length 1.5m with side slope of 1:2. The top width of the fill is 10.5 m and $G = 2.7$ .	
D	Define shrinkage limit of soil. An undisturbed sample of clay brought from the field was noted to have a volume of 18.0cc and weight 30.8 gm. On oven drying the weight of the sample reduced to 20.5 gm. The volume of dried sample as obtained by displacement of mercury was 12.5 cc. Calculate the shrinkage limit and the specific gravity of solids.	
E	Derive an expression of permeability of stratified soils in horizontal and vertical direction. Draw neat soil profile consisting of four number of soil layers with $H_1$ , $H_2$ , $H_3$ and $H_4$ in thickness with their permeability as $k_1$ , $k_2$ , $k_3$ and $k_4$ respectively.	
F	Explain the factors affecting compaction.	

<b>Q3.</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	A Falling Head permeameter accommodates a soil sample 10 cm high and $50\text{cm}^2$ in cross sectional area. The permeability of the sample is expected to be $1 \times 10^{-4}$ cm/sec. If it is desired that the head in the Stand pipe should fall from 81 cm to 50 cm in 50 minutes, determine the size of the standpipe which should be used.	
B	Derive relation between void ratio, degree of saturation, specific gravity and water content using appropriate phase diagram and nomenclature	
C	The moisture content of an undisturbed sample of clay is 26.5% at full saturation. The specific gravity of the soil is 2.5 and it has a dry unit weight of $3.3 \text{ kN/m}^3$ , determine (i) saturated unit weight (ii) submerged unit weight (iii) void ratio for the specimen.	
D	Explain the importance of gradation of soil. Describe typical particle size	

	distribution curve using appropriate diagram.
E	List out various soil boring techniques and explain any one in detail with a neat diagram.
F	In site reclamation project, 2.5 m of graded fill ( $\gamma = 22 \text{ kN/m}^3$ ) were laid in compacted layers over an existing layer of silty clay ( $\gamma = 18 \text{ kN/m}^3$ ) which was 3m thick. This layer of silty clay is underlain by a 2 m thick layer of gravel ( $\gamma = 20 \text{ kN/m}^3$ ). Assuming that the water table remains at the surface of the silty clay. Draw the effective stress profiles for case (1) before the fill is placed and (2) after the fill is placed.

# University of Mumbai

## Examination 2020 under cluster KJSIEIT

Program: **Civil Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester V

Course Code: CE-C503 and Course Name: Applied Hydraulics

Time: 2 hour

Max. Marks: 80

Q1	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	As per the principle of moment of momentum, the resultant external torque about any axis is equal to:
Option A:	Rate of change of momentum about the axis.
Option B:	Change of moment of momentum about the axis
Option C:	Rate of change of angular momentum about the axis.
Option D:	Change of angular momentum about the axis
2.	A jet of water of diameter 50 mm has a direct impact on a fixed plate & exerts a force of 1225 N. Find the rate of discharge?
Option A:	0.049 cumecs
Option B:	1.025 cumecs
Option C:	0.785 cumecs
Option D:	0.001 cumecs
3.	Without effecting the efficiency of turbine, unit quantities of turbine are the quantities, obtained, when turbine is working under:
Option A:	Unit Speed
Option B:	Unit Head
Option C:	Unit Discharge
Option D:	Unit Power
4.	The channel whose boundary is not deformable is known as:
Option A:	Rigid channel
Option B:	Prismatic channel
Option C:	Mobile channel
Option D:	Boundary channel
5.	For Pelton wheel with multiple jets, the specific speed of turbine in SI system is:
Option A:	8.5-30
Option B:	30-51
Option C:	51-225
Option D:	225-860
6.	As per impulse momentum equation, for steady incompressible flow if the resultant external force acting on fluid mass is zero, then:
Option A:	Momentum of fluid at inlet section is greater than momentum of outlet section.
Option B:	Momentum of fluid at outlet section is greater than momentum at inlet section.

Option C:	Momentum of fluid is zero throughout.
Option D:	Momentum of fluid remains constant throughout.
7.	In case of propeller turbine:
Option A:	Area of flow at inlet is equal to area of flow at outlet
Option B:	Depth of bucket is 1.2 times diameter of jet.
Option C:	Discharge, $Q = \pi D_1 B_1 V_{f1}$
Option D:	The ratio of width of wheel at inlet to its diameter at inlet ranges between 0.1 to 0.4.
8.	$[M L^{-1} T^{-1}]$ is the dimension of:
Option A:	Force
Option B:	Surface Tension
Option C:	Pressure
Option D:	Momentum
9.	Which place in hydraulic turbine is most susceptible for cavitation:
Option A:	Inlet of draft tube
Option B:	Draft tube exit
Option C:	Blade inlet
Option D:	Guide blade
10.	Under which of the following conditions steady non uniform flow in open channel occurs?
Option A:	When for a constant discharge the liquid depth in the channel varies along its length
Option B:	When a constant discharge flows at constant depth
Option C:	When a constant discharge flows in channel laid at constant slope
Option D:	When the discharge & the depth both vary along the channel length
11.	When the depth of flow gradually changes over a length of the channel, then the flow will be termed as:
Option A:	Rapidly varied flow
Option B:	Critical Flow
Option C:	Gradually Varied Flow
Option D:	Uniform flow
12.	A 200 mm diameter pipe conveys water at a velocity of 3.50 m/s. For the condition of dynamic similarity what is the velocity of oil flowing in a 80 mm diameter pipe? Take kinematic viscosity of water and oil equal to 0.01stoke and 0.03 stoke respectively
Option A:	26.25 m/s
Option B:	28.32 m/s
Option C:	7.5 m/s
Option D:	17.5 m/s
13.	Two hydraulic turbines are similar & homologous when they are geometrically similar and have:
Option A:	The same specific speed
Option B:	The same rotational speed
Option C:	The same Froude's number

Option D:	The same Thoma's number
14.	The comparison between pumps operating in series & in parallel is:
Option A:	Pumps operating in series boost the head, whereas pumps operating in parallel boost the discharge.
Option B:	Pumps operating in series boost the discharge, whereas pumps operating in parallel boost the head.
Option C:	In both cases, there will be boost in head only.
Option D:	In both cases there will be boost in discharge only.
15.	Kinematic similarity between model & prototype is the similarity of:
Option A:	Shape
Option B:	Discharge
Option C:	Stream line pattern
Option D:	Forces
16.	For a centrifugal pump, the net positive suction head (NPSH) is defined as,
Option A:	(velocity head + pressure head) at suction
Option B:	(velocity head + pressure head) at discharge
Option C:	(velocity head + pressure head – vapor pressure of the liquid) at suction
Option D:	(velocity head + pressure head – vapor pressure of the liquid) at discharge
17.	Guide blade angle is the :
Option A:	Angle between the direction of jet at inlet & direction of motion of plate at inlet
Option B:	Angle made by relative velocity at inlet with the direction of motion of plate at inlet.
Option C:	Angle between the direction of jet at outlet & direction of motion of plate at outlet
Option D:	Angle made by relative velocity at outlet with the direction of motion of plate at outlet.
18.	The velocity & depth of flow in a 3.0 m wide rectangular channel are 2.0 m/s & 2.5 m respectively. If the channel has its width enlarged to 3.5 m at a section, the discharge past that section is:
Option A:	10.0 cumecs
Option B:	20.0 cumecs
Option C:	15.0 cumecs
Option D:	17.5 cumecs
19.	The total energy head for an open channel flow is written with casual notations as $H = z + y + (v^2/2g)$ . In this each of the term represents:
Option A:	Energy in kg.m/kg mass of fluid
Option B:	Energy in N.m/N of fluid
Option C:	Power in kW/kg mass of fluid
Option D:	Energy in N.m/mass of fluid
20.	In actual practise, when jet of water strikes, series of vanes, the efficiency will be maximum, when:
Option A:	Angle $\phi$ is minimum.
Option B:	Angle $\beta$ is maximum.
Option C:	Angle $\phi$ is zero.
Option D:	Angle $\beta$ is zero.

<b>Q2</b>	<b>Sub question A &amp; B Carries 10 marks each</b>
<b>A</b>	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	A centrifugal pump has a 300 mm diameter impeller & an outlet width of 50 mm. It runs at 1000rpm delivering water against a head of 15 meters. The vanes are curved backwards at an angle of $30^\circ$ with the periphery at outlet. The manometric efficiency of the pump is 92%. Calculate the discharge.
ii.	A 150 mm diameter jet moving at 30 m/s impinges on a series of a vanes moving at 15m/s in the direction of the jet. The jet leaves the vanes at $60^\circ$ with the direction of motion of the vanes, Calculate the force exerted by the jet in the direction of motion of the vanes & work done by the jet per second
iii.	A 3 m wide rectangular channel conveys 12 cumecs of water at a depth of 2m. Calculate i) Specific energy of flowing fluid; ii) Critical depth, critical velocity and the minimum specific energy; iii) Froude's Number.
<b>B</b>	<b>Solve any One</b> <span style="float: right;"><b>10 marks each</b></span>
i.	A $45^\circ$ reducing bend is connected in a pipeline, the diameters at the inlet & outlet of the bend being 400 mm & 200 mm respectively. If the rate of flow of water is 0.4 cumecs & the pressure intensity at inlet to bend is 100 kPa, find the force exerted by water on the bend.
ii.	The lift force $F_l$ on an air foil depends upon the mass density $\rho$ of the medium, velocity of the flow $v$ , a characteristic length $l$ , the viscosity $\mu$ and the angle of attack $\alpha$ . Obtain an expression for the lift force.

<b>Q3</b>	<b>Sub question A &amp; B Carries 10 marks each</b>
<b>A</b>	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	A pelton wheel 2.45 m in diameter works under a head of 370 m. Find the power supplied to the turbine and its speed. Assume outlet relative velocity is reduced by 10 %. Peripheral velocity as 40.045 m/s. Coefficient of velocity as 0.98, outlet vane angle as $20^\circ$ . Jet diameter as 180 mm
ii.	Two geometrically similar pumps are run at the same speed of 1000 rpm. One pump has an impeller diameter of 0.30 m & lifts water at the rate of 20 liters per second against a head of 15 m. Determine the head & impeller diameter of other pump to deliver half the discharge.
iii.	Find the slope at which a circular sewer of 1.50 m diameter should be laid to provide the maximum velocity at a discharge of 0.75 cumecs. Take $N = 0.015$
<b>B</b>	<b>Solve any One</b> <span style="float: right;"><b>10 marks each</b></span>
i.	The loss of energy head in a hydraulic jump is 4.25 m. The Froude number just before the jump is 7.50. Find i) discharge per meter width of the channel ii) depths before & after hydraulic jumps iii) Froude number after the jump iv) Percentage loss of energy head due to the jump.
ii.	The inner & outer diameters of an inward flow reaction turbine are 1.25 m & 1.60 m respectively. The vane angle at the inlet is $95^\circ$ , while the guide blade angle is $22^\circ 30'$ . The axial depth of the wheel of inlet & outlet is 0.50 m. The turbine runs at 150 rpm. Determine i) The discharge of the turbine; ii) The outlet vane angle; iii) Shaft power.

**University of Mumbai**  
**Examination 2020 under cluster KJSIET**

Program: **CIVIL ENGINEERING**

Curriculum Scheme: **Rev 2016**

Examination: **TE** Semester: **V**

Course Code: **CEC-504** and Course Name: **Environmental Engineering –I**

Time: 2 hour

Max. Marks: 80

<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	A ----- is a screw down type of sluice valve which is used in smaller sized pipes in service connections for stopping or opening the supply.
Option A:	Ferrule
Option B:	Service pipe
Option C:	Stop cock
Option D:	Water meter
2.	Which water piping system in buildings eliminates the need for storage tanks which may be a major source of contamination?
Option A:	Piping system using direct supply
Option B:	Piping system using overhead tank
Option C:	Piping System using Underground-Overhead Tank supply
Option D:	Pumped systems
3.	What will be the resultant decibel level when two sources make noise of equal decibels?
Option A:	Decibel level will be the same
Option B:	Decibel level will decrease by 3 decibels
Option C:	Decibel level will increase by 3 decibels
Option D:	Decibel level will be equal to the sum of decibels of the two sources
4.	The paddles in a flocculator tank usually rotate at a speed of-----
Option A:	30 to 40 rpm
Option B:	10 to 20 rpm
Option C:	20 to 30 rpm
Option D:	2-3 rpm
5.	For a city or town with roads of rectangular pattern, type of layout used for pipe distribution is -----
Option A:	Dead End System
Option B:	GravitySystem
Option C:	Radial System

Option D:	Grid Iron System
6.	Collected rainwater in litres is given by?
Option A:	annual rainfall in mm x volume in $m^3$ x runoff factor
Option B:	annual rainfall in mm x depth in m
Option C:	rainfall in mm x volume in $m^3$
Option D:	annual rainfall in mm x area in $m^2$ x runoff factor
7.	How can thermal pollution be prevented?
Option A:	Heated water from the industries can be treated by installation of oxidation ponds
Option B:	Thermal pollution can be prevented by using wet scrubber
Option C:	Thermal pollution can be prevented by using heated gas
Option D:	Heated water from the industries can be treated by installation of cooling tower and cooling ponds
8.	Chlorine usage in the treatment of 24000 cubic meter per day is 7 kg/day. The residue after 10 min contact is 0.20mg/lit. Calculate the dosage and chlorine demand of the water in milligrams per lit.
Option A:	0.4 , 0.2
Option B:	0.292, 0.092
Option C:	0.5, 0.092
Option D:	0.6, 0.92
9.	The amount of coagulant in the jar which produces a good floc with the ----- amount of coagulant, indicates the optimum dosage.
Option A:	large
Option B:	Average
Option C:	medium
Option D:	Least
10.	The water meter ,which is installed on individual house connections, on municipal supplies ,is-----
Option A:	venturimeter
Option B:	pH meter
Option C:	Displacement meter
Option D:	stop cock
11.	The uniformity coefficient is---
Option A:	[D60/D20]
Option B:	[D60/D10]
Option C:	[D60/D30]
Option D:	[D60/D40]
12.	The major source of 'Carbon monoxide' in the urban atmosphere is due to -----
Option A:	Decomposition of organics
Option B:	Chemical reaction between VOC and NOx
Option C:	Complete combustion in the presence of sunlight

Option D:	Incomplete combustion of fuel
13.	Determine the quantity of alum required per day in order to treat 16 million litres of water per day at a treatment plant, where 15ppm of alum dose is required? Also determine the amount of carbon dioxide gas which will be released per liter of water treated?
Option A:	156kg, 5.54kg
Option B:	240 kg, 5.95 mg
Option C:	156ppm, 4.54mg
Option D:	240 ppm, 5.95 mg
14.	Which of these is the most effective residual for disinfection?
Option A:	Hypochlorite ions
Option B:	Monochloramine
Option C:	Hypochlorous acid
Option D:	Dichloramine
15.	Volume of reservoir required for a water distribution network can generally be reduced by
Option A:	increasing the pressure at supply line
Option B:	decreasing the pressure at supply line
Option C:	increasing the number of supply hours
Option D:	decreasing the number of supply hours
16.	Pathogenic bacteria are found by
Option A:	NPK test
Option B:	MPN test
Option C:	MNK test
Option D:	MKP test
17.	Which of these techniques are suitable for removal of emerging organics such as pesticides, pharmaceuticals and personal care products traces from water:
Option A:	coagulation –flocculation followed by rapid sand filtration
Option B:	Activated carbon or membrane processes such as ultra filtration and reverse osmosis
Option C:	Ion exchange or electrodialysis
Option D:	Disinfection
18.	If the annual average hourly demand of the city is 2000 meter cube per hour, what is the maximum hourly consumption (assume daily peak factor as 1.8 and hourly peak factor as 1.5)?
Option A:	5400 meter cube per hour
Option B:	54000 meter cube per hour
Option C:	3600 meter cube per hour
Option D:	36000 meter cube per hour
19.	Coarse screen consist of parallel iron rods placed vertically or at a slight slope at about --- to --- centre to centre distance.
Option A:	2 to 10 cm

Option B:	20 to 30cm
Option C:	2 to 10 mm
Option D:	1mm to 5mm
20.	Fluctuating noise levels from various sources at a place over a period of time can be represented by a constant value over that entire time period, by a value of sound, known as :
Option A:	Average noise level
Option B:	Equivalent noise level
Option C:	Arithmetic noise level
Option D:	Logarithmic noise level

<b>Q2.</b> <b>(20 Marks )</b>	
<b>A</b>	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	Describe the necessity of having a planned water supply schemes for a city. Discuss How are such schemes financed, planned and executed?
ii.	Design a circular sedimentation tank filled with mechanical sludge remover for a water work which has to supply daily 4 million liters of water to the town. The detention period in the tank is 4 hours & the depth of water in the tank may be assumed as 3.2m.
iii.	Explain briefly: Break point chlorination and Super chlorination.
<b>B</b>	<b>Solve any One</b> <span style="float: right;"><b>10 marks</b></span>
i.	Enlist different method for water softening. Explain Zeolite process with neat sketch.
ii.	Design Under-drainage system of rapid sand filter consist of central manifold pipe with laterals having perforations at their bottom. Given : Filtered water required per hour= 0.190ML/hr, Rate of filtration= 4500 lit/hr/sqm. Also design wash water troughs. Assume the necessary data.

<b>Q3.</b> <b>(20 Marks )</b>	
<b>A</b>	<b>Solve any TWO</b> <span style="float: right;"><b>5 marks each</b></span>
i.	Name most common nontoxic metals found in water supplies, identify their sources and discuss their impacts.
ii.	Explain with a neat sketch as to how municipal water mains are connected to private buildings and houses for giving water supply connections.
iii.	What is meant by the term 'Per capita demand'? How is it estimated? How provision is done for Fire Demand in water supply?

<b>B</b>	<b>Solve any ONE</b>	<b>10 marks</b>
i.	Enumerate and describe briefly the various types of engineering devices that are used to control emission of particulate matter from factories.	
ii.	Write the assumptions for ideal sedimentation tank and prove with suitable derivation that the efficiency of sedimentation tank is independent of depth of the tank. Explain the factors affecting sedimentation process.	

**University of Mumbai**  
**Examination 2020 under cluster KJSIET**

Program: Civil Engineering  
Curriculum Scheme: Rev2016  
Examination: TE Semester V

Course Code: CE-C505 and Course Name: Transportation Engineering - I

Time: 2 hour

Max. Marks: 80

Q1.	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	Nagpur Road Plan has recommended the use of road pattern type of
Option A:	Star and Block Pattern
Option B:	Star and Grid Pattern
Option C:	Star and Circular Pattern
Option D:	Star and Hexagonal Pattern
2.	Primary system of roads consists of?
Option A:	National Highways and Expressways
Option B:	Major District Roads and Other District Roads
Option C:	National Highways and State Highways
Option D:	State Highways and Major District Roads
3.	Head light sight distance for a one way road is considered equal to
Option A:	Overtaking sight distance
Option B:	Intermediate sight distance
Option C:	Compromising sight distance
Option D:	Stopping sight distance
4.	What is the psychological widening of a pavement on horizontal curve of radius 230m for ruling speed 80kmph.
Option A:	0.455m
Option B:	0.555m
Option C:	0.186m
Option D:	0.136m
5.	What is the value of the lateral coefficient of the friction as per the IRC.
Option A:	0.007
Option B:	0.07
Option C:	0.15
Option D:	0.3
6.	The curve provided at the change of gradient is called:
Option A:	Horizontal Curve
Option B:	Transition Curve
Option C:	Reverse Curve
Option D:	Vertical Curve
7.	The traffic that is prepared based on 365 days of the year is called?

Option A:	Average daily traffic
Option B:	Annual average daily traffic
Option C:	Annual average weekday traffic
Option D:	Average yearly traffic
8.	If the instantaneous speed of 4 vehicles are 35 kmph, 40 kmph, 45 kmph and 50 kmph then the time mean speed will be _____
Option A:	40kmph
Option B:	42.5kmph
Option C:	41.5kmph
Option D:	43kmph
9.	A road sign indicating 'No Parking'
Option A:	Warning sign
Option B:	Informatory sign
Option C:	Stop sign
Option D:	Regulatory sign
10.	Los Angeles testing machine is used to conduct
Option A:	Abrasion test
Option B:	Stripping value test
Option C:	Crushing value test
Option D:	Impact test
11.	Which of the following property of bitumen is related to Pensky – Martens test.
Option A:	Ductility
Option B:	Flash and fire point
Option C:	Softening point
Option D:	Viscosity
12.	Which of the following test measures the toughness of road aggregates.
Option A:	Crushing strength test
Option B:	Abrasion test
Option C:	Impact test
Option D:	Shape test
13.	The joint provided at end of day work in CC pavement is called as
Option A:	Expansion joint
Option B:	Construction joint
Option C:	Contraction Joint
Option D:	Clear joint
14.	The method of design of flexible pavement as recommended by IRC is
Option A:	Group index method
Option B:	Westergaad method
Option C:	Benkelman beam method
Option D:	CBR method
15.	As per IRC, maximum load of axle of a vehicle should not exceed.
Option A:	810kg

Option B:	7500kg
Option C:	7510kg
Option D:	8170kg
16.	Benkelman beam method measures
Option A:	Stresses under standard wheel loads
Option B:	Deflection under standard wheel loads
Option C:	Crack with under standard wheel loads
Option D:	Bending moment under standard wheel loads
17.	Alligator or map cracking is the common type of failure in:
Option A:	Water Bound Macadam road
Option B:	Concrete pavement
Option C:	Gravel road
Option D:	Bitumen surfacing
18.	The defect formed due to lack of binding property
Option A:	Raveling
Option B:	Damaged edges
Option C:	Formation of potholes
Option D:	Formation of ruts
19.	When the bituminous surfacing is done on already existing bituminous surface or over existing cement concrete road, the type of treatment to be given as:
Option A:	Tack coat
Option B:	Spray of emulsion
Option C:	Seal coat
Option D:	Prime coat
20.	The removal and diversion of surface water from the roadway is called _____
Option A:	Surface drainage
Option B:	Sub surface drainage
Option C:	Camber
Option D:	Cross slope

<b>Q2.</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Explain various requirement of an ideal highway alignment. Also explain various factors controlling the alignment of road.	
B	For a 7 m wide road having curve of radius 200 m, if the length of wheel base is 6.5 m, find the extra widening required for the design speed of 65 kmph.	
C	What is traffic rotary? What are its advantages and limitations?	
D	Explain the mechanics of soil stabilization.	
E	Discuss on i. Radius of relative stiffness ii. Modulus of subgrade reaction iii. Contact pressure and tyre pressure	
F	Discuss on various rigid pavement failures.	

<b>Q3.</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Define and State the situation under which following gradients are provided. i.) Ruling gradient ii.) Limiting gradient iii.) Exceptional gradient iv.) Minimum gradient	
B	Explain PCU and give the values of PCU for various vehicle category at midblock.	
C	Compare Bitumen, Tar and Asphalt.	
D	Determine Million Standard Axle for divided road having 3 lanes with initial traffic 600 cypd during start of construction. Rate of growth is 7.5 %, VDF is 2.5, CBR is 4 %, construction period is 2 years & design life is 15 years.	
E	Calculate the equivalent radius of resisting section of 20cmthick slab, given that the radius of contact area wheel load is 12cm	
F	What is Overlay? Discuss on its types.	