University of Mumbai

Examination 2021 under cluster __ (Lead College: _____)

Examinations Commencing from 1 June 2021

Program: **BE Civil Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: CEC601 and Course Name: Geotechnical Engineering-II

Time: 2 hour Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Choose the most appropriate statement. During a consolidation test, at 50% average degree of consolidation, the effective stress is
Option A:	zero
Option B:	equal to total stress
Option C:	less than total stress
Option D:	equal to excess pore water pressure
2.	Choose the wrong statement.
Option A:	Consolidation test on a soil is a stress controlled test.
Option B:	Consolidation occurs due to dissipation of excess pore water pressure.
Option C:	During consolidation, void ratio of the soil decreases.
Option D:	During consolidation, degree of saturation decreases.
3.	A clay layer 4 m thick is sandwiched between two sand layers and subjected to some vertical pressure from the superstructure built over it. Co-efficient of consolidation was found to be 0.025 cm^2/min. Calculate the time required for 50% consolidation.
Option A:	around 10 months
Option B:	around 12 months
Option C:	around 7 months
Option D:	around 5 months
4.	In a UU triaxial test on pure clay sample, confining pressure was 50 kN/m^2, deviator stress at failure was 110 kN/m^2 and pore water pressure measured at failure was 30 kN/m^2. Calculate the effective major principal stress at failure.
Option A:	60 kN/m^2
Option B:	130 kN/m^2
Option C:	100 kN/m^2
Option D:	80 kN/m^2
5.	The concept of shear strength is not required directly to analyse the problems related to which one of the following?
Option A:	flow through the soil mass
Option B:	bearing capacity of foundations
Option C:	stability of earth slopes
Option D:	lateral earth pressure from soils on retaining structures

6.	A saturated clay sample was subjected to CD triaxial test. Cell pressure = 50 kN/m^2. Major principal stress at failure = 150 kN/m^2. At failure, estimate the normal stress on an inclined plane making an angle of 30 degree with the major principal plane inside the soil sample.
Option A:	55 kN/m^2
Option B:	110 kN/m^2
Option C:	75 kN/m^2
Option D:	125 kN/m^2
7.	The backfill behind a retaining wall consists of cohesionless soil having $\phi = 30°$ and unit weight of 19 kN/m^3. The backfill surface is horizontal. If the wall is pushed towards the backfill, calculate applying Rankine's concept the inclination of possible failure plane with horizontal is?
Option A:	30°
Option B:	60°
Option C:	45°
Option D:	15°
8.	A vertical smooth retaining wall is supporting 8 m height backfill of cohesionless sand with an angle of internal friction of 30° and dry unit weight of 18 kN/m^3. The water table rises to the backfill surface. Saturated unit weight of the backfill is 22 kN/m^3. Estimate the total active earth pressure force (rounded to the nearest integer) acting on the wall.
Option A:	444 kN/m
Option B:	524 kN/m
Option C:	555 kN/m
Option D:	424 kN/m
9.	From Culmann's graphical method, the active earth pressure force is determine by measuring from the tangent point on Culmann's line
Option A:	the normal distance to ϕ-line
Option B:	the distance to ϕ-line parallel to ψ-line
Option C:	the normal distance to ψ-line
Option D:	the distance to ψ -line parallel to ϕ-line
10.	A square footing 2.5 m by 2.5 m is built in a homogeneous bed of sand of unit weight 20 kN/m^3 and having an angle of shearing resistance of 36°. The depth of the base of footing is 1.5 m below the ground surface. Nc = 65.4, Nq = 49.4, $N\gamma$ = 54.0. Calculate the safe load that can be carried by a footing with a factor of safety of 3 considering general shear failure. Use Terzaghi's analysis.
Option A:	5462.5 kN
Option B:	5800.5 kN
Option C:	6250 kN
Option D:	5200 kN
11.	When the water table rises to the ground surface, the ultimate bearing capacity of a shallow foundation on sand is reduced about
Option A:	50%
Option B:	75%
Option C:	25%

Option D:	0%
12.	The permissible settlement is the maximum in the case of
Option A:	Isolated footing on clay
Option B:	Raft on clay
Option C:	Isolated footing on sand
Option D:	Raft on sand
13.	The equation given by Skempton for compression index for a remoulded sample is
Option A:	$C_c=0.009(w_L-10\%)$
Option B:	$C_c=0.007(w_L-10\%)$
Option C:	$C_c=0.007(w_L-20\%)$
Option D:	$C_c=0.007(w_L-30\%)$
14.	A long natural slope of cohesionless soil is inclined at 12° to the horizontal. What will be the factor of safety of the slope if $\varphi = 30°$?
Option A:	0.13
Option B:	0.4
Option C:	2.72
Option D:	0.4
15.	Failure of the stability of slopes, generally occurs along
Option A:	Slip plane
Option B:	A curved surface
Option C:	A horizontal surface
Option D:	All the surfaces
16.	If the failure occurs along a surface of sliding that intersect the slope at its toe, the slide is known as
Option A:	Base failure
Option B:	Face failure
Option C:	Slope failure
Option D:	Combined failure
17.	If a hammer is raised by steam and allowed to fall by gravity on top of the pile, it is called as
Option A:	Single acting hammer
Option B:	Vibratory hammer
Option C:	Diesel hammer
Option D:	Drop hammer
18.	The piles that are used for protecting structures from ships and floating object is
Option A:	Anchor piles
Option B:	Compaction piles
Option C:	Fender piles
Option D:	Batter piles
19.	The piles that are used for protecting structures from ships and floating object is
Option A:	Compaction piles

Option B:	Anchor piles
Option C:	Fender piles
Option D:	Batter piles
20.	If the angle of internal friction decreases, then K_a
Option A:	decreases
Option B:	increases
Option C:	equal to zero
Option D:	does not change

Q2 (20 Marks)	
A	**Solve any Two** **5 marks each**
i.	Explain spring analogy theory for primary consolidation.
ii.	Classify shear tests depending upon drainage condition and how these are simulated to field conditions.
iii.	What are different types of slope failures? Explain briefly finite and infinite slopes.
B	**Solve any One** **10 marks each**
i.	A saturated soil stratum 6m thick lies above an impervious stratum and below a previous stratum. It has a compression index 0.28 and a coefficient of permeability of 3.5 x 10^{-4} cm/sec. Its void ratio at a stress of 150kPa is 1.95. Determine (i) the change in void ratio due to an increase in stress to 210kPa; (ii) settlement of the soil stratum due to the above increase in stress; and (iii) time required for 50% consolidation. Assume, time factor (T) for 50% consolidation as 0.20.
ii.	The following data relate to a triaxial compression test performed on a soil sample. i) determine the total and effective stress parameter of the soil. ii) draw failure envelope from Mohr circles.

Test No	Cell Pressure (kPa)	Max. Deviator Stress (kPa)	Pore Pressure at Max. Deviator Stress (kPa)
1	80	175	45
2	150	240	50
3	210	300	60

Q3 (20 Marks)	
A	**Solve any Two** **5 marks each**
i.	Compare Rankine's theory of lateral earth pressure to coulomb's theory of lateral earth pressure.
ii.	Mention different types of shallow foundation and briefly explain with neat sketch.
iii.	Classify and briefly explain different types of pile foundation based on load

	transfer, function and method of construction.
B	**Solve any One** **10 marks each**
i.	A smooth rigid retaining wall of 6m high carries a uniform surcharge load of 12kPa. The backfill is clayey sand possessing the following properties: Υ=16kN/m^3, ϕ=25^o, and c = 6.5kPa. Determine the passive earth pressure and draw the pressure diagram.
ii.	A footing 2m square is laid at a depth of 1.3m below the ground surface. Determine the net ultimate bearing capacity of sand using I.S. code method. Take Υ=20kN/m^3 and ϕ=30^o. With continuation of above parameters determine the net ultimate bearing capacity of the footing if: (i) the water table rises to the level of the base, and (ii) the water table is 1m below the base.

University of Mumbai

Examination 2021 under cluster __ (Lead College: _KJSIEIT_)

Examinations Commencing from 1 June 2021

Program: **_Civil Engineering**

Curriculum Scheme: Rev - 2016

Examination: TE Semester VI

Course Code: (CE-C602) and Course Name: Design and Drawing of Steel Structure

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What should be the effective length of column whose both ends are held in position and restrained against rotation
Option A:	1.00L
Option B:	0.80L
Option C:	0.65L
Option D:	2L
2.	Buckling class of Channel, angle , T and solid sections is
Option A:	d
Option B:	c
Option C:	a
Option D:	b
3.	The angle of inclination ɵ of lacing bar with the longitudinal axis kept in between angle
Option A:	40-70 degree
Option B:	35-65 degree
Option C:	30-70 degree
Option D:	25-45 degree
4.	The slenderness ration KL/r for lacing bar should not exceed
Option A:	165
Option B:	135
Option C:	155
Option D:	145
5.	Slenderness ratio for lacing system should be
Option A:	(kL/r)
Option B:	1.05(kL/r)
Option C:	1.5(kL/r)
Option D:	2(kL/r)
6.	Condition to find the spacing between channels in built column should be
Option A:	Iyy=Izz
Option B:	Iyy>Izz

Option C:	Iyy<Izz
Option D:	Iyy≠Izz
7.	If h/bf is greater than 1.2 and thickness of flange tf is less than or equal to 40, the buckling class about Y-Y axis should be
Option A:	b
Option B:	c
Option C:	a
Option D:	d
8.	The area of slab base may be computed by
Option A:	A=P/2fck
Option B:	A=P/fck
Option C:	A=P/0.65fck
Option D:	A=P/0.45fck
9.	Size of base plate for a column for a column ISHB 300 @ 618 N/m subjected to a factored axial compressive load of 1200 kN should be
Option A:	400x450
Option B:	350x500
Option C:	400x350
Option D:	350x450
10.	Section is plastic when
Option A:	b/tf > 8.4E
Option B:	b/tf ≤ 8.4E
Option C:	b/tf ≤ 9E
Option D:	b/tf > 9E
11.	For Column most economical section is
Option A:	Solid section
Option B:	I-section
Option C:	Angle section
Option D:	Tubular section
12.	web will cripple due to
Option A:	Concentrated load
Option B:	Deflection at center
Option C:	Torsion at ends
Option D:	Maximum bending moment
13.	A simply supported beam carrying a central load, will be safe in deflection if the ratio span/depth is
Option A:	<15
Option B:	<20
Option C:	<24
Option D:	>15
14.	Minimum pitch of bolt of diameter d should not be less than

Option A:	2.5d
Option B:	1.25d
Option C:	3d
Option D:	2d
15.	For shop welded members, partial factor of safety is
Option A:	1.10
Option B:	1.25
Option C:	1.20
Option D:	1.5
16.	Row of bolts parallel to direction of stress
Option A:	Edge line
Option B:	End line
Option C:	Pitch line
Option D:	Gauge ling
17.	βb for plastic section is
Option A:	1
Option B:	Ze/Zp
Option C:	2
Option D:	Zp/Ze
18.	Condition for no shear buckling
Option A:	Vp=1.5Vn
Option B:	Vp>Vn
Option C:	Vp=Vn
Option D:	Vp<Vn
19.	Ductility is
Option A:	Buckling due to compression
Option B:	Toughness of material
Option C:	Bending without cracks
Option D:	Stretching without breaking
20.	Economical depth of plate girder corresponds to
Option A:	Minimum Thickness
Option B:	Minimum depth
Option C:	Minimum weight
Option D:	Minimum width

Q2 **(20 Marks)**	**Solve any Two out of three** **10 marks each**
A	A simply supported welded plate girder of an effective span of 25m subjected to a UDL of 30kN/m excluding self-weight. Flanges are laterally supported throughout span. Solve till… a) Cross Section design and draw neatly b) Provide check for bending stress

B	Design a simply supported beam of 7m span. Total UDL acting on beam is 30kN/m.
C	A tension member 3m long carries a factored tensile load of 150kN. Design with suitable angle section connection made with 20mm dia. bolts with grade 4.6

Q3 **(20 Marks)**	**Solve any Two out of three** **10 marks each**
A	A column is subjected to a factored load of 1000kN. It has an effective length of 8m. Consider both ends are fixed. Design a column take fy=250N/mm^2
B	An 8m long column under the effect of 1200kN factored axial load. Design a buildup column with two channel sections back to back and single lacing system.
C	A steel column ISHB250@536.6N/m is subjected to a factored load of 1200kN. Design a slab base for column. Use M20 grade of concrete.

University of Mumbai

Examination 2021 under cluster __ (Lead College: __KJSIEIT_____)

Examinations Commencing from 1 June 2021

Program: **Civil Engineering**

Curriculum Scheme: **Rev - 2016**

Examination: **Third Year,Semester VI**

Course Code: **CEC603** and Course Name: **Transportation Engineering -II**

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	In earliest stage of development of railways, which type of rails were used?
Option A:	Flat footed rails
Option B:	Double headed rails
Option C:	Bull headed rails
Option D:	Flat headed rails
2.	A train is travelling from Darjeeling to Siliguri at 110 km/hr , due to the foggy weather which limits the visibility what type of signal is used to guide the train driver
Option A:	Fixed Signal
Option B:	Detonating Signal
Option C:	Hand Signals
Option D:	Stop Signal
3.	Ruling Gradient for an Urban city with increasing population area having a Cross Slope of 38% is
Option A:	1 in 150
Option B:	1 in 180
Option C:	1 in 200
Option D:	1 in 250
4.	What is the extra width of gauge required for a curve of radius 168m, for a vehicle having wheel base of 6m. Diameter of wheel is 152.4cm and depth of flange below top of the rail is 3.2cm
Option A:	13.2 cm
Option B:	3.21 cm
Option C:	12.3 cm
Option D:	2.31 cm
5.	An engineer examined reduction in cross-sectional dimension of I section, He concluded it as
Option A:	Wear of rails
Option B:	Creep of rails
Option C:	Failure of rails
Option D:	Split web

6.	To avoid the conflicting movement between the signal operations and the points of crossings, the arrangement designed is
Option A:	crossing
Option B:	signaling
Option C:	interlocking
Option D:	shunting
7.	On Lonavala - Karjat Railway section, at some places…….gradient is provided
Option A:	Ruling Gradient
Option B:	Pusher Gradient
Option C:	Momentum Gradient
Option D:	Station Yard Gradient
8.	While constructing a new railway track , which plate laying method is widely used in Indian Railways
Option A:	Tram line method
Option B:	Side method
Option C:	American method
Option D:	Telescopic method
9.	The wind intensity that does not play any role in landing and takeoff operations of an aircraft at a airport located at mean sea level is
Option A:	Below 4.6 km/hr
Option B:	Above 5 km/hr
Option C:	Between 5-10 km/hr
Option D:	Below 6.4 km/hr
10.	The bearing of runway is $100^{0,}$ then runway number towards that direction is
Option A:	100
Option B:	10
Option C:	280
Option D:	28
11.	An extra Gauge width on track is mandatory on
Option A:	Horizontal curves
Option B:	Vertical Curves
Option C:	Summit curve
Option D:	Valley curve
12.	A pilot is trying to land an aircraft at a airport having three runways A, B and C. The head winds at the runways are 35kmph, 23kmph and 42kmph respectively. What would be the ideal preference of runways for the pilot to land the aircraft safely
Option A:	A, B,C
Option B:	B,A,C
Option C:	C,A,B
Option D:	C,B,A

13.	If mean of the maximum daily temperatures is 50^{o} and mean of average daily temperatures is 40^{o}, for the hottest month at an airport site, the airport reference temperature in degree Celsius is
Option A:	43.3
Option B:	53.3
Option C:	35.5
Option D:	45.5
14.	Landing direction indicator and wind direction indicator are placed
Option A:	At the end of runway
Option B:	At the start of runway
Option C:	On the terminal building
Option D:	In the segmented circle
15.	Construction of ..... makes it possible to use the area as a safe anchorage for ships and to facilitate loading of cargo in comparatively calm waters.
Option A:	pier
Option B:	wharf
Option C:	breakwater
Option D:	pier head
16.	The place where new ships are built
Option A:	Harbour
Option B:	Dry Dock
Option C:	Wet Dock
Option D:	Port
17.	Wharves that project at right angles to the shore for ships to come closer for loading and unloading are called
Option A:	Fender
Option B:	Jetties
Option C:	Quay
Option D:	Pier
18.	The length available in the bridge between extreme edge of a water surface at the highest flood level, measured at right angles to the abutment faces is
Option A:	Linear waterway
Option B:	Effective Linear waterway
Option C:	Free board
Option D:	Effective span
19.	For economic span of bridge, cost of substructure is
Option A:	More than cost of superstructure
Option B:	Less than cost of superstructure
Option C:	Equal to cost of superstructure
Option D:	Independent of cost of superstructure
20.	Afflux occurs due to
Option A:	Increase in discharge
Option B:	Contraction of linear waterway

Option C:	Increase in velocity of flow
Option D:	Scouring

Descriptive questions

Q2. (20 Marks)	**Solve any Four out of Six** **5 marks each**
A	Describe the working principle of a Turnout designed for high speeds trains with a neat figure
B	How are the wheels of a rolling stock designed to prevent the lateral movement in trains? Explain in detail with a suitable diagram
C	A maintenance engineer on site examines that the expansion gap in the track is less than the permissible value, name the defect and what can be the causes and how can it be rectified.
D	Calculate number of rails, sleepers and all the fixtures and fastening required for a 100 km BG track with concrete sleeper and having sleeper density as M+7.
E	A BG 1^0 branch line track takes off as a contrary flexure through a 1 in 16 turnout from a main line track of 3^0 curvature. Due to the turnout, the maximum permissible speed on the branch line is 40 km/h. Calculate the super elevation to be provided on the branch line track and the maximum permissible speed on main line track (when it takes off from straight track)
F	Design a turnout of 1 in 8.5 for an urban city in Maharashtra in plain terrain areas,In the design the curve is tangential to tongue rail,springs up from the heel of switch at 1^0 34' 27" and ends at TNC. Assume heel divergence= 13.6 cm

Q3. (20 Marks)	**Solve any Four out of Six** **5 marks each**
A	The length of runway under standard condition is 1620m. The airport reference temperature is 32°C and has an elevation of 320m. The runway is to be constructed with an equivalent gradient of 0.20%. Determine the corrected length of the runway.
B	What are the two types of flight rules and explain how ATC is helpful in each case.
C	Explain the working of those parts available in an aircraft to maneuver in space in all three direction
D	How are docks different from harbour? What are the classification of docks? Name any two natural and artificial in India
E	What is the component of a bridge connecting bridge piers and the bridge deck ? Classify the component with its utility.

F	Find the maximum depth of scour for a bridge consisting of 2 spans of 40m each. Discharge of the stream is 200 m^3/s. Assume Lacey's silt factor as 1.0

University of Mumbai

Examination 2021 under cluster __(Lead College: ___KJSIEIT_____)

Examinations Commencing from 1 June 2021

Program: Civil Engineering

Curriculum Scheme: Rev - 2016

Examination: TE Semester VI

Course Code: CEC604 and Course Name: Environmental Engineering-II

Time: 2-hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Sewers are normally not subjected to the following test before they are put into service.
Option A:	Smoke test
Option B:	Water test
Option C:	Shadow test
Option D:	Air test
2.	A bulked sludge is the one that has
Option A:	Good settling characteristics and poor compatibility.
Option B:	Poor settling characteristics and good compatibility.
Option C:	Poor settling characteristics and poor compatibility.
Option D:	Good settling characteristics and good compatibility.
3.	When chlorine is added to sewage both at the beginning as well as at the end of the treatment process, the phenomenon is called
Option A:	Post chlorination
Option B:	Super chlorination
Option C:	Split chlorination
Option D:	Pre chlorination
4.	In a flowing stream, what is the effect of the breakdown of degradable wastes by bacteria on dissolved oxygen?
Option A:	Increases
Option B:	Depletes
Option C:	Maintains
Option D:	Improves
5.	The use of pure oxygen as a substitute for air in the activated sludge process has gained in popularity since
Option A:	1960
Option B:	1980
Option C:	1970
Option D:	1990
6.	Traps
Option A:	are water seals which prevent the entry of foul gases
Option B:	are used to trap the rats entering sewers

Option C:	are not dissolve the foul gases
Option D:	create symphonic action to increase the quick disposal of sewerage
7.	The type of joint is not used for joining the pipes or sewers is
Option A:	Flexible joint
Option B:	Expansion joint
Option C:	Complex joint
Option D:	Mechanical joint
8.	Sludge (either wet, or dry or incinerated) cannot be finally disposed of by the following method.
Option A:	Spreading on farm land
Option B:	Digestion
Option C:	Land fills
Option D:	Disposal in water or sea
9.	The sewer which received discharge from two or more main sewers, is known as
Option A:	A trunk sewer
Option B:	An outfall sewer
Option C:	A cross sewer
Option D:	An intercepting sewer
10.	The 1-day BOD at 30 degree C of waste water sample is 110 mg/lt. Determine ultimate BOD. Assume K = 0.1/day at 20-degree C.
Option A:	Lo = 160.68 mg/lt
Option B:	Lo = 260.68 mg/lt
Option C:	Lo = 480. 68 mgl/lt
Option D:	Lo = 360.68 mg/lt
11.	Which types of bacteria are used in trickling filters?
Option A:	Facultative
Option B:	Nitrifying
Option C:	Anaerobic
Option D:	Blue-green bacteria
12.	In sludge drying bed the depth of sand may vary from
Option A:	20 to 30 cm.
Option B:	40 to 50 cm
Option C:	30 to 40 cm
Option D:	50 to 60 cm
13.	The working condition in imhoff tank are
Option A:	Aerobic only
Option B:	Anaerobic only
Option C:	Aerobic in lower compartment and anaerobic in upper compartment
Option D:	Aerobic in upper compartment and anaerobic in lower compartment
14.	Another name of Mean Cell Residence Time is
Option A:	Aeration period
Option B:	Volumetric loading

Option C:	F/M ratio
Option D:	Sludge age
15.	Which of the following is not the zone of pollution in a stream or river?
Option A:	Zone of disinfection
Option B:	Zone of degradation
Option C:	Zone of active decomposition
Option D:	Zone of recovery
16.	Sewage cannot be applied by the following methods of irrigation:
Option A:	Spray irrigation
Option B:	Overland flow irrigation
Option C:	Surface irrigation
Option D:	Sub-surface irrigation
17.	Drop manholes are the manholes
Option A:	Without entry ladders
Option B:	Without manhole covers
Option C:	With depths more than 3.5 m
Option D:	Having drains at different levels
18.	Which are the three ingredients in activated sludge systems?
Option A:	Cells, sewage and oxygen
Option B:	Cells, sewage and nitrogen
Option C:	Solids, sewage and oxygen
Option D:	Solids, water and oxygen
19.	What is the percentage of methane produced during sludge digestion?
Option A:	0-15%
Option B:	15-30%
Option C:	30-45%
Option D:	60-70%
20.	Which of the following action is not involved in self-purification process of streams?
Option A:	Dilution
Option B:	Concentration
Option C:	Action of sunlight
Option D:	Reduction

Q. 2. A	**Solve any Two (5 marks each) (Total: 10 Marks)**
i.	Write short note on plastic wastes and hazardous wastes.
ii.	Enlist various sewer appurtenances. Explain any one with neat sketch.
iii.	Distinguish between combined & separate system of sewerage.
Q.2. B	**Solve any One (10 marks each) (Total: 10 Marks Each)**
i.	Explain flow sheet for conventional sewage treatment plant with neat sketch.

ii.	Design the dimensions of a septic tank for a small colony of 150 persons provided with an assured water supply from the municipal head-works at a rate of 120 litres per person per day. Assume suitable data if necessary.

Q.3. A	**Solve any Two (5 marks each) (Total: 10 Marks)**
i.	What do you understand by self-purification property of a stream? Explain the factors affecting this property.
ii.	Explain sludge thickening & dewatering in brief.
iii.	Differentiate between single pipe and single stack plumbing system with neat sketch.
Q.3. B	**Solve any One (10 marks each) (Total: 10 Marks Each)**
i.	Determine the size of high-rate trickling filter for the following data: 1. Sewage Flow = 4.5 MLD, 2. BOD of raw sewage = 250 mg/lit, 3. Recirculation ratio = 1.5 4. BOD removed in primary Clarifier = 30% 5. Final effluent BOD desired = 30 mg/lit
ii.	An average operating data for conventional activated sludge treatment plant is as follows: 1. Wastewater flow = 35000 m^3/day 2. Volume of aeration tank = 10900 m^3 3. Influent BOD = 250 mg/l 4. Effluent BOD = 20 mg/l 5. MLSS = 2500 mg/l 6. Effluent suspended solids = 30 mg/l 7. Waste sludge suspended solids = 9700 mg/l 8. Quantity of waste sludge = 220 m^3/d. Determine: a. Aeration period in hours. b. F/M Ratio (kg BOD per day/kg MLSS). c. Percentage efficiency of BOD removal. d. Sludge age (days).

University of Mumbai

Examination 2021 under cluster __ (Lead College: _KJSIEIT_)

Examinations Commencing from 1 June 2021

Program: T.E.(Civil) (Rev-2016) (Choice based)

Curriculum Scheme: Rev - 2016

Examination: TE VI

Course Code: CEC605_ and Course Name: Water Resources Engineering –I

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The system of irrigation practiced on Hill slope is
Option A:	Contour farming
Option B:	Check irrigation
Option C:	Border method of irrigation
Option D:	Sprinkler irrigation
2.	For standing crops in undulating sandy fields, the best method of irrigation is
Option A:	Sprinkler irrigation
Option B:	Free flooding
Option C:	Check method
Option D:	Furrow method
3.	Mixed cropping is defined as
Option A:	Two or more crops grown during any year
Option B:	Two or more crops grown during the same crop , season in different fields
Option C:	Two or more crop seasons of the year
Option D:	Growing of two or more crops together in the same field during the same crop season.
4.	Irrigation frequency is a function of
Option A:	Crop only
Option B:	Soil, crop and climate
Option C:	Soil, crop, climate and fertilizer
Option D:	Soil and climate
5.	If Duty (D) is 1428 Ha/cumecs and base period (B) is 120 days for an irrigated crop, then delta in meters is given by
Option A:	1.028m
Option B:	0.73m
Option C:	1.38m
Option D:	0.01m
6.	The ration of quantity of water stored in the root zone of the crops to the quantity of water actually delivered in the field is known as
Option A:	Water conveyance efficiency
Option B:	Water application efficiency

Option C:	Water use efficiency
Option D:	Water storage efficiency
7.	With the increase in the quantity of Water supplied the yield of the most crops
Option A:	Increases continuously
Option B:	Decreases continuously
Option C:	Increases up to a certain limit and then decrease
Option D:	Increases up to a certain limit and then becomes constant
8.	The following recording gauge produces the mass curve of precipitation as their record.
Option A:	Symons rain gauge
Option B:	Tipping – bucket type
Option C:	Weighing- bucket type
Option D:	Both Symons and tipping bucket type
9.	A Hyetograph is a plot of
Option A:	Rainfall volume with time.
Option B:	Rainfall intensity with time.
Option C:	rainfall intensity with duration
Option D:	Discharge vs. time.
10.	The rate of rainfall for successive 30 min periods of a 4 – hour storm are as follows: 3.5, 6.5, 8.5, 7.8, 6.4, 4.0, 4.0, 6.0, cm /hr. Taking a value of φ – index as 4.5 cm/hour. Compute the 1. Total rainfall 2. Total rainfall excess 3. W- index
Option A:	23.35cm, 6.35cm, 4.25 cm/hr.
Option B:	23.00cm, 6.00 cm, 4.00 cm/hr.
Option C:	24.5cm, 6.5cm, 4.5cm/hr.
Option D:	25.5cm , 7.0cm , 5.0 cm/hr.
11.	When base flow is separated from the storm- hydrograph the resulting plot is known as
Option A:	Excess – run off hydrograph
Option B:	Excess – rainfall hydrograph
Option C:	Direct – runoff hydrograph
Option D:	Direct – rainfall hydrograph
12.	A geological formation which neither contains water nor transmit any water through it.
Option A:	Aquifer
Option B:	Aquifuge
Option C:	Aquitard
Option D:	Aquiclude
13.	Specific capacity
Option A:	A constant for a given well
Option B:	Depends on aquifer characteristic
Option C:	Increases with discharge rate

Option D:	Decreases with time from the start of pumping
14.	A 45- cm well penetrates an unconfined aquifer of saturated thickness 30 m completely. Under a steady pumping rate for a long time the drawdown at two observation wells 15 m and 30 m form the well are 5.0 m and 4.2 m respectively. If the permeability of the aquifer is 20 m /day, determine the discharge and the drawdown at the pumping well.
Option A:	3683.90 m^3/sec , drawdown – 10.54 m
Option B:	3790.89 m^3/sec , drawdown – 9.54 m
Option C:	3650. 67 m^3/sec , drawdown – 8.54 m
Option D:	3860.76 , m^3/sec , drawdown – 6.54 m
15.	The volume of water that can be extracted by force of gravity from a unit volume of aquifer material is called
Option A:	Specific retention
Option B:	Specific yield
Option C:	Specific capacity
Option D:	Specific storage
16.	Yield of a reservoir represents
Option A:	the inflow into the reservoir
Option B:	the capacity of the reservoir
Option C:	the outflow demand on the reservoir
Option D:	the optimum value of catchment yield
17.	The surcharge storage in a dam reservoir is the volume of water stored between
Option A:	Minimum and maximum reservoir levels
Option B:	Minimum and normal reservoir levels
Option C:	Normal and maximum reservoir levels
Option D:	Dead storage level and maximum reservoir level .
18.	Bank storage in dam reservoir
Option A:	Increases the computed reservoir capacity
Option B:	Decreases the computed reservoir capacity
Option C:	Sometime increases and sometime decreases the computed reservoir capacity.
Option D:	Has no effect on computed reservoir capacity.
19.	A Dam reservoir , catering to flood control , irrigation and water supply although basically design for irrigation alone is a
Option A:	Multipurpose reservoir
Option B:	Single purpose reservoir
Option C:	Distribution reservoir
Option D:	Single purpose and multipurpose reservoir.
20.	The method of growing crops on ridges , running on the sides of water ditches , is known as
Option A:	Flood irrigation
Option B:	Furrow irrigation
Option C:	Check irrigation
Option D:	Basin irrigation

<table>
<tr><td>Q2</td><td></td></tr>
<tr><td>A</td><td>Solve any Two 5 marks each</td></tr>
<tr><td>i.</td><td>Explain the factor affecting runoff</td></tr>
<tr><td>ii.</td><td>Explain the methods of improving duty</td></tr>
<tr><td>iii.</td><td>Explain the zones of storage in a reservoir.</td></tr>
<tr><td>B</td><td>Solve any One 10 marks each</td></tr>
<tr><td>i.</td><td>Table below gives the necessary data about the crop, their duty and area under each crop, commanded by a canal taking off from storage tank. Taking time factor for the canal to be 0.65 and capacity factor 0.8. Determine the design discharge for the canal, considering transit losses as 15 %.
<table>
<tr><td>Crop</td><td>Base period(days)</td><td>Area (Ha)</td><td>Duty at the head of the canal (Ha/cumec)</td></tr>
<tr><td>Sugarcane</td><td>320</td><td>850</td><td>580</td></tr>
<tr><td>Overlap for sugarcane in hot weather</td><td>90</td><td>120</td><td>580</td></tr>
<tr><td>Wheat (R)</td><td>120</td><td>600</td><td>1600</td></tr>
<tr><td>Bajri (K)</td><td>120</td><td>500</td><td>2000</td></tr>
<tr><td>Vegetable (HW)</td><td>120</td><td>360</td><td>600</td></tr>
</table></td></tr>
<tr><td>ii.</td><td>Find the ordinates of the storm hydrograph resulting from a 3 hr. storm with rainfall of 2 cm, 6.75 cm and 3.75 cm during subsequent 3 hrs. intervals. The ordinates of unit 3 hr. hydrograph are given in the following table
<table>
<tr><td>Time (hrs)</td><td>03</td><td>06</td><td>09</td><td>12</td><td>15</td><td>18</td><td>21</td><td>24</td></tr>
<tr><td>Ordinates of UH(Cumecs)</td><td>0</td><td>110</td><td>365</td><td>500</td><td>390</td><td>310</td><td>250</td><td>235</td></tr>
<tr><td>Time (hrs)</td><td>03</td><td>06</td><td>09</td><td>12</td><td>15</td><td>18</td><td>21</td><td>24</td></tr>
<tr><td>Ordinates of UH(Cumecs)</td><td>175</td><td>130</td><td>95</td><td>65</td><td>40</td><td>22</td><td>10</td><td>0</td></tr>
</table></td></tr>
<tr><td></td><td>Assume an initial loss of 5 mm, infiltration index of 2.5 mm/hour and base flow of 10 cumecs</td></tr>
<tr><td></td><td></td></tr>
</table>

<table>
<tr><td>Q3</td><td></td></tr>
<tr><td>A</td><td>Solve any Two 5 marks each</td></tr>
<tr><td>i.</td><td>Explain the different surface irrigation methods.</td></tr>
<tr><td>ii.</td><td>Derive an expression for discharge from well fully penetrating in a unconfined aquifer.</td></tr>
<tr><td>iii.</td><td>Describe the various methods of computing average rainfall over a basin.</td></tr>
<tr><td>B</td><td>Solve any One 10 marks each</td></tr>
<tr><td>i.</td><td>A well penetrates fully 10 m thick confined aquifer of medium sand having coefficient of permeability as 0.005 m/s. The well radius is 10 cm and is to be worked under a drawdown of 4 m at the well face. Calculate the discharge from the well. What will be the percentage increases in the discharge if the radius of the well is doubled? Take R=300m in each case.</td></tr>
</table>

<table>
<tr><td>ii.</td><td>Fix the control levels D.S.L., F.R.L, H.F.L and T.B.L from the given data
1. Effective storage required for the crops = 3200 ham
2. Carryover allowance = 10 % of effective storage.
3. Tank losses = 20 % of effective storage
4. Dead storage = 10 % of gross storage.
5. Wind velocity = 80 kmph.
6. Fetch length = 30 km.
7. Length of spillway = 80 m.
8. M.F.D.= 500 m^3/s
9. Use Francis formula – Q = 1.84 L H ^3/2.
<table><tr><td>Contour RL(m)</td><td>81</td><td>84</td><td>87</td><td>-</td><td>105</td><td>108</td><td>111</td></tr><tr><td>Storage (Mm^3)</td><td>3.62</td><td>4.25</td><td>5.33</td><td>-</td><td>44.75</td><td>49.26</td><td>59.25</td></tr></table></td></tr>
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University of Mumbai

Examination 2021 under cluster __ (Lead College: __KJSIEIT_____)

Examinations Commencing from 1 June 2021Examinations Commencing from 1 June 2021

Program: CIVIL ENGINEERING

Curriculum Scheme: Rev - 2016

Examination: TE Semester : VI

Course Code: DLO 6061 and Course Name: Advanced Construction Equipments

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Concrete used to construct walls of nuclear reactor should have higher
Option A:	permeability
Option B:	density
Option C:	porosity
Option D:	Specific gravity
2.	In Major Construction projects the method normally used for concreting is
Option A:	Pan tilting mixer
Option B:	RMC Plant and Transit Mixer
Option C:	Non-Tilting mixer
Option D:	Non-Tilting Pan mixer with blades.
3.	The most suitable cross- section for transportation tunnels is
Option A:	Rectangular
Option B:	Square
Option C:	Circular
Option D:	Horse shoe shape
4.	Blasting gelatin is made up of:
Option A:	Nitroglycerine and ammonium nitrate
Option B:	Nitroglycerine and sodium nitrate.
Option C:	Nitroglycerine and guncotton.
Option D:	Nitroglycerine only.
5.	The main equipment used for Pulling and pushing other equipment is
Option A:	Bulldozer
Option B:	Scraper
Option C:	Tractor
Option D:	Power shovel
6.	A Rotary type drill whose abrasive power depends on the bit which is in the form of a section of steel pipe with serrated or a roughened lower end.
Option A:	Percussion drill
Option B:	Shot drill
Option C:	Diamond drill
Option D:	Churn drill

7.	Structural elements used to transfer load to the ground having sufficient bearing capacity but restricted accessibility and vulnerable to settlement is
Option A:	Vertical Shaft Sinking Machine
Option B:	Tunnel Lining trolley
Option C:	Micro piles
Option D:	Jumbo
8.	If N is the number of shafts used then the total number of faces available for attacking the excavation and construction in tunnel are
Option A:	2N
Option B:	N+2
Option C:	2N+1
Option D:	2N+2
9.	In NATM method of Tunnelling, the soil excavated by Jumbo is carried outside through
Option A:	Trucks
Option B:	Scrapers
Option C:	Rollers
Option D:	Belt conveyors
10.	The crane widely used for constructing high rise buildings is
Option A:	Derrick crane
Option B:	Traveller crane
Option C:	Tower Crane
Option D:	Gantry crane.
11.	The material used in Mivan Shuttering is
Option A:	Steel
Option B:	Plastic
Option C:	Aluminium
Option D:	Composite fiber
12.	Which statement is not related to Doka formwork
Option A:	Reduction in consumption of timber.
Option B:	No. of reuses more than 8 times that of conventional timber
Option C:	Economical and long - lasting.
Option D:	Heavy weight and difficult to assemble
13.	Excellent concrete surface requiring no further finishing is given by
Option A:	Timber
Option B:	Teak wood
Option C:	Steel/Aluminium
Option D:	PVC
14.	The technology which can locate subsurface utilities is
Option A:	Pipeline insertion system
Option B:	Incremental launch
Option C:	Ground Penetrating Radar
Option D:	Cantilever method

15.	Pipeline Insertion System is
Option A:	An automated pipe laying system
Option B:	A manual system
Option C:	Unsuitable for open cut trenches
Option D:	Unsuitable for tunnels.
16.	A method of bridge construction out of the following is
Option A:	Forepoling method
Option B:	Incremental launching
Option C:	Heading and benching method
Option D:	Full face method
17.	Wheel type and ladder type are types of
Option A:	Stone crushers
Option B:	Trenching machines
Option C:	Jack hammers
Option D:	draglines
18.	Electricity transmission towers in mountainous areas are erected with the help of
Option A:	trolley
Option B:	helicopters
Option C:	Gantry cranes
Option D:	Mobile cranes
19.	Well point is a system used for
Option A:	Dewatering trenches.
Option B:	Driving piles.
Option C:	Digging wells.
Option D:	Constructing well foundations.
20.	The equipment which is used to lay asphalt on roads, bridges, parking lots is
Option A:	GPR
Option B:	GPS
Option C:	bulldozer
Option D:	Paver

Q2	**Solve any Two Questions out of Three** **10 marks each**
A	Enlist the different types of drilling machines and explain any two in detail.
B	Explain any two methods of bridge construction.
C	Draw the layout of a hydropower station. Enlist the equipments required for construction of a hydro-power plant.

Q3	**Solve any Two Questions out of Three** **10 marks each**
A	Explain the stage wise construction of an Airport & state the equipments required.
B	Explain the working of Ground Penetrating Radar for locating underground utilities
C	Explain the working of Vertical Shaft Sinking Machine