AIKTC/KRRC/SoET/ACKN/QUES/2018-19/   Date: _____

School: __SoET-CBCS__   Branch: __CIVIL ENGG.__   SEM: __III__

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format SC	Format HC	No. of Copies
1	Applied Mathematics- III	CE-C301		✓	02
2	Surveying- I	CE-C302		✓	02
3	Strength of materials	CE-C303		✓	02
4	Engineering geology	CE-C305		✓	02
5	Fluid mechanics- I	CE-C306		✓	02

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

(3hours) [Total marks: 80]

N.B. 1) Question No. 1 is compulsory.
   2) Answer **any Three** from remaining
   3) Figures to the right indicate full marks

1. a) Find Laplace transform of $f(t) = t \int_0^t e^{-2u} \sin 4u \, du$. 5

   b) Show that the set of functions $\sin nx, n = 1,2,3 \dots \dots$ is orthogonal on $(0,2\pi)$. 5

   c) Calculate Spearman's rank correlation coefficient R, from the given data, 5
X:	12,	17,	22,	27,	32.
Y:	113,	119,	117,	115,	121

   d) Find the constants a, b, c, d, e if
   $$f(z) = ax^3 + bxy^2 + 3x^2 + cy^2 + x + d(dx^2y - 2y^3 + exy + y)$$
   is analytic. 5

2. a) Find Laplace transform of the periodic function, defined as
   $$f(t) = \begin{cases} t, & 0 < t < 1 \\ 0, & 1 < t < 2 \end{cases} \text{ and } f(t + 2) = f(t) \text{ for } t > 0$$
   6

   b) If $v = 3x^2y + 6xy - y^3$, show that v is harmonic and find the corresponding analytic function $f(z) = u + iv$. 6

   c) Obtain Fourier series of $f(x) = x^2$ in $(0,2\pi)$. Hence, deduce that – 8
   $$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$

3. a) Using convolution theorem, find the inverse Laplace transform of 6
   $$F(s) = \frac{1}{s^2(s + 5)^2}$$

   b) Solve $\frac{\partial^2 u}{\partial x^2} - 16\frac{\partial u}{\partial t} = 0$, subject to the conditions,
   $u(0, t) = 0, u(1, t) = 3t, u(x, 0) = 0, \quad 0 \leq x \leq 1$, taking $h = 0.25$
   up to 3 seconds only by using Bender –Schmidt method. 6

   c) Using Residue theorem, evaluate,
   i) $\int_0^{2\pi} \frac{d\theta}{17 - 8\cos\theta}$ ii) $\int_0^\infty \frac{dx}{(x^2+1)^2}$ 8

[TURN OVER]

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4. a) Solve by Crank –Nicholson simplified formula $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$.

   $u(0, t) = 0$, $u(1, t) = 0$, $u(x, 0) = 100(x - x^2)$, with $h = 0.25$ for one-time step.   6

   b) Evaluate $\int_C \frac{z}{(z-2)(z+1)^2} dz$, $C: |z| = 3$.   6

   c) Solve $(D^2 - 2D + 1)y = e^{-t}$ with $y(0) = 2$, $y'(0) = -1$ where $D \equiv \frac{d}{dt}$ 8

5. a) Obtain all possible Taylor's and Laurent series which represent the function

   $f(z) = \frac{z}{z^2 - 5z + 6}$ indicating the region of convergence.   6

   b) Evaluate $\int_0^\infty t e^t \cos^2 t \, dt$ 6

   c) Obtain half range Fourier cosine series of $f(x) = x(\pi - x), 0 < x < \pi$.
   Using Parseval's identity, deduce that –   8

   $$\frac{\pi^4}{90} = \frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + \ldots$$

6. a) Find the image of the circle $|z| = 2$ under the transformation $w = z + 3 + 2i$.
   Draw the sketch.   6

   b) A rectangular metal plate with insulated surfaces of width l and so long as compared to its breadth that it can be considered infinite in length without introducing an appreciable error. If the temperature along one short edge $y = 0$ is given by $u(x, 0) = u_0 \sin\left(\frac{\pi x}{l}\right)$ for $0 < x < l$ and other long edges $x = 0$ and $x = l$ and the short edges are kept at zero degrees temperature, find the function $u(x, y)$ describing the steady state, assuming that in the steady state the heat distribution function $u(x, y)$ satisfies the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$.   6

   c) Production (in metric kiloton) of wheat in a country is given by the following data,

Year (x)	2005	2007	2009	2011	2013	2015	2017
Production (y)	8	12	15	19	21	22	25

   Fit a straight line to the data and estimate the production in the year 2010.   8

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SF-sem-III-choice Based -Civil   14/5/19

Paper / Subject Code: 50802 / Surveying-I

Q.P. Code: 27304

3 Hours   80 Marks

Q 1 is compulsory. Attempt **any three** questions from the remaining questions.

Q.1 Write the principles and applications of :   (20)

   a) Surveying. b) Tacheometry. c) Leveling. d) Plane table surveying.

Q.2   (20)

a The following readings are a page of an old level book. The readings in the book were   08
written with pencil & some of these got erased. The same are marked with question marks.
Fill up the missing quantities showing the calculation & apply the usual checks.

Station	B.S	I.S	F.S	Rise	Fall	RL	Remarks
1	?					150.000	BM
2		2.457			0.827	?	
3		2.400		0.057		?	
4	2.697		?		?	148.07	TP
5	?		2.051	0.646		148.716	TP
6		2.500		1.068		148.784	
7		2.896		?		149.388	
8		?			0.124	?	
9			2.672	0.348		149.612	

b Describe procedure and application of reciprocal leveling.   06
c Point out the difference between **any three** from following.   06

   1) GTS bench mark & Permanent bench mark. 2) Leveling staff & Open cross staff.
   3) Surveyors Compass & Prismatic Compass 4) Base line and Tie line.

Q.3   (20)

a List accessories required for Plane Table Survey and explain traversing method with its   07
suitability.
c Define Contour. State engineering applications of Contour maps.   06
d A big pond obstructs chain line PQ. Line PL was measured as 901m on left of the line PQ   07
for circumventing the obstacle. Similarly line PM was measured as 1100m on right of line
PQ such that points L-Q-M are in the same straight line. Lengths of QL and QM are 502m
and 548m respectively. Find distance PQ.

Q.4   (20)

a The following bearings were taken for a closed compass traverse in survey project: 10

Line	AB	BC	CD	DE	EA
FB	48°25'	177°45'	104°15'	165°15'	259°30'
B B	230°0'	356°0'	284°55'	345°15'	79°0'

State which stations are affected by local attraction and determine correct bearings. Further,
calculate the true bearings, if the declination was 1°30' W.

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Paper / Subject Code: 50802 / Surveying-I

Q.P. Code: 27304

Q.4

b Write short note on **any two** from following: 10
   i.   Magnetic declination and its effects.
   ii. Prismatic compass with its uses & advantages.
   iii. Indirect ranging (procedure and sketch)

Q.5   (20)

a A tacheometer fitted with an analytical lens is set up at an intermediate point on a traverse   10
   course PQ & following observations are made on a vertically held staff:

Instrument station	Staff Station	Bearing	Staff intercept	Vertical Angle	Axial hair Readings	Remarks
O	P	130°	3.550	+8° 45' 0"	2.195	R L of P
	Q	220°	2.055	+6° 30' 0"	1.685	is 321.50m

Find distance and gradient between stations P and Q.

b Describe in detail procedure of taking bearing of a line with theodolite.   05
c Explain in detail the use of theodolite as a level.   05

Q.6   (20)

a For a closed traverse ABCD, due to some obstructions, it was not possible to observe   07
   bearings of lines BC & CD. Calculate missing bearings.

Line	AB	BC	CD	DA
Length in metres	500	1200	880	1050
WCB	60°	?	?	310°

b A 20 m chain was found to be 4 cm too long after chaining 1400 m. It was 8 cm too long at   05
   the end of day's work after chaining a total distance of 2420 m. If the chain was correct
   before commencement of the work, find the true distance.

c Write short note on **any two** from the following: 08
   1) Trapezoidal and parabolic rule for area calculation.
   2) Gale's Traverse Table
   3) Different axes of a theodolite and their interrelationships.

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(03 HOURS)   **TOTAL MARKS : 80**

Instructions : (1). Question No .1 is compulsory
　　　　　　 (2) Answer any *Three Questions* from the remaining.
　　　　　　 (3) Each full question carries **20** marks.
　　　　　　 (4) Assume suitable data, if needed and state it clearly.

Q.1　　Attempt any four

　　a　A solid metal rod circular in section, tapers from 30 mm diameter to 15 mm　(05M)
　　　　diameter in a length of 300 mm. How much will this length increase under an
　　　　axial pull of 20 kN, if E = 110 GPa.

　　b　State the relationships between rate of loading, shear force and bending　(05M)
　　　　moment at a C/S of a beam and mention their applications.

　　c　A steel bar 32 mm in diameter is 3 m long. Find the work done when an axial　(05M)
　　　　pull of 80 kN is applied suddenly to it. Calculate the maximum instantaneous
　　　　stress and elongation produced. Take $E = 2 \times 10^5$ MPa.

　　d　The angle of twist of a 5.5 m length of solid circular shaft whose diameter is 90　(05M)
　　　　mm is observed to be 3.44° when the shaft is revolving 4 Hz. If G = 80 GPa,
　　　　find the power transmitted by the shaft.

　　e　Derive the 'Middle third rule' for a rectangular section in the case of no-tension　(05M)
　　　　condition.

　　f　Enlist the assumptions made in the Euler's column theory.　(05M)

Q.2　a)　A prismatic bar as shown in figure, carries an axial load of 25 kN. Calculate　(08M)
　　　　　the reactions at the supports assuming them rigid.
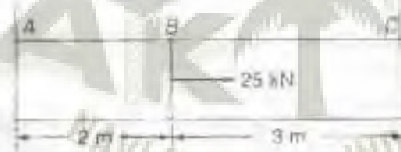
　　b)　Draw the shear force and bending moment diagrams for the overhanging beam　(12M)
　　　　　carrying loads as shown in figure. Marks the values of the principal ordinates
　　　　　and locate the point of contraflexure.
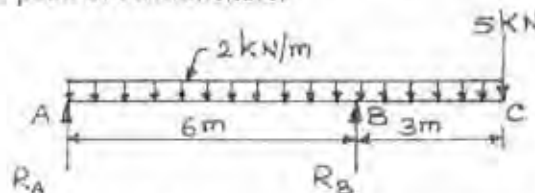
Q.3　a)　A timber beam of rectangular section is simply supported at the ends and carries　(12M)
　　　　　a point load at the centre of the beam. If the allowable design stresses are 12
　　　　　N/mm² in bending and 1 N/mm² in shear, what will be the span to depth ratio so
　　　　　that the maximum bending and shear stresses occur simultaneously?

　　b)　Derive the relationship between three elastic moduli (i.e. E,G and K)　(08M)

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Q.4 a) During tests on a sample of steel bar 25 mm in diameter, it is found that the pull   (10M)
         of 50 kN produces an extension of 0.095 mm on a length of 200 mm and a torque
         200 N-m produces an angular twist of 0.9^0 on a length of 250 mm. Find the
         Poisson's Ratio of the steel.

     b) A timber joist of 125 mm width and 250 mm depth is used as a cantilever beam   (10M)
         of 3 m length and loaded with a point load at its free end in addition to its self-
         weight, so that the bending stresses does not exceed 9 N/mm². Determine the
         maximum value of the applied load. Take unit weight of timber is 5000 N/m³.

Q.5 a) The line of thrust, in a compression testing specimen 15 mm diameter, is parallel   (10M)
         to the axis of specimen but is displaced from it. Calculate the distance of the
         line of thrust from the axis when the maximum stress is 20 % greater than the
         mean stress on a normal section.

     b) The tensile and compressive stresses at a point across two mutually   (10M)
         Perpendicular planes are 200 N/mm² and 100 N/mm². Determine graphically,
         the normal, shear (tangential) and resultant stresses on a inclined plane at 30^0
         to the axis of minor stress by using Mohr's circle.

Q.6 a) A simply supported beam of length 4 m is subjected to a concentrated load of 60   (10M)
         kN at the mid span and deflects 15 mm at the centre. Determine the Euler's
         crippling load when the beam is used as a column with one end is fixed and other
         end hinged. Also find the safe load taking FOS as 4.

     b) A cylindrical shell is 3 m long, and is having 1 m internal diameter and 15 mm   (10M)
         thickness. Calculate the maximum intensity of shear stress induced and also the
         changes in the dimensions of the shell, if it is subjected to an internal fluid
         pressure 1.5 N/mm². Take E = ~~2×10~~ N/mm² & μ = 0.3.
         $= 2 \times 10^5$

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IR@AIKTC

SE - sem-III. Choice Based - Civil
Paper / Subject Code: 50804 / Engineering Geology

aiktcdspace.org

24/5/1

Q.P.Code: 27622

REVISED COURSE

(3 Hours)

Total Marks : 80

N.B. 1. Question No. 1 is compulsory
2. Attempt any Three questions out of remaining Five questions.
3. Draw neat labelled diagrams wherever necessary.
4. All the parts of a question should be grouped together.
5. Figures to the right indicate marks

Q.1a	Name the following -	5
(i)	Two minerals which possess good cleavage	
(ii)	Two non silicate minerals	
(iii)	Two minerals with high specific gravity	
(iv)	A mineral with cherry red streak and ore of iron	
(v)	Name the minerals which occur in fibrous form and bladed form	

Q.1b	Define the following terms-	5
(i)	Solifluction	
(ii)	Engineering Geology	
(iii)	Volcanic Bomb	
(iv)	Mesa	
(v)	Aquiclude	

Q.1c	Draw diagram for the following -	5
(i)	Crater	
(ii)	Gravity Dam	
(iii)	Phacolith	
(iv)	Conglomerate	
(v)	Box fold	

Q.1d	Give reasons for the following -	5
(i)	Movement of tectonic plates	
(ii)	High seismicity in the northern part of India	
(iii)	Clay is not a good aquifer despite having high porosity	
(iv)	Development of columnar joints in basalt	
(v)	Development of caves (karst topography and sink hole) in limestone	

Q.2(a)	What are glaciers? Describe various landforms created by glaciers.	10
(b)	What are the plate boundaries? Describe divergent plate boundaries, in which part of the earth do you expect them? Give examples.	6
(c)	Briefly explain layered structure of the earth by giving thickness of each layer.	4

Q.3(a)	Give classification of igneous rocks.	5
(b)	What is texture? Explain any two textures of igneous rocks.	5
(c)	Name structures of sedimentary rocks and describe any two in detail.	5
(d)	Name the agents of metamorphism and describe dynamothermal metamorphism?	5

Turn Over

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Q.4(a)   What are Faults? Describe various types of faults and comment on their engineering consideration.   10

(b)   Describe any two laws of stratigraphy.   5

(c)   An ore body of pyrite is exposed on a horizontal ground and dipping southward. The width of the outcrop is 300 m. A borehole sunk from the upper bedding plane touches the lower bedding plane at a depth of 250 m. Determine its true thickness and amount of Inclination.   5

Q.5(a)   What are the conditions required for any rock to be an aquifer, describe confined and Unconfined aquifer.   6

(b)   Describe the favourable geological structures for dam.   6

(c)   What is RQD? Calculate the RQD from given data and comment on the suitability of Rock for foundation based on your result.   8
Total length of the core is 2m-

Sample No	Length of the core in cms.	Nature of the lower end of the core sample	Sample No	Length of the core in cms	Nature of the lower end of the core sample
1	12	N	11	15	N
2	7	N	12	16	M
3	11	N	13	7	N
4	10	N	14	11	N
5	6	M	15	9	M
6	3	N	16	5	N
7	13	N	17	9	N
8	12	N	18	12	N
9	6	M	19	6	N
10	17	N	20	9	N

Q.6   Differentiate between any 5 of the following-   5X4=20
(i)   Tunnel axis parallel to dip and tunnel axis parallel to strike
(ii)   Angular unconformity and Disconformity
(iii)   Flowing well and non flowing well
(iv)   Mechanical weathering and chemical weathering
(v)   Overturned and recumbent fold
(vi)   Central eruption and fissure eruption
(vii)   Primary and secondary structures in rock
(viii)   Electrical resistivity and seismic method of geophysical exploration

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Q. P. Code: 21635

(3 hours)

Max. Marks: 80

N.B.: -

1. **Q.1 is compulsory**
2. Attempt any **three** question out of remaining **five**
3. Assume **suitable** data if **required**

1. Attempt the following

a) Write a short note on capillarity and surface tension   5

b) Experimental methods of determining hydraulic coefficients   5

c) Differentiate between langrangian and eularian methods   5

d) Explain circulation and vorticity   5

2.   a) A triangular plate of 1 meter base and 1.5 meter altitude is immersed in water .The plane of the plate is inclined at 30° with free water surface and the byls parallel to and at a depth of 2 m from water surface. Find the total pressure on the plate and the position of centre of pressure.   10

       b) A venturimeter of size 200 mn × 100 mm is used to measure the flow of liquid of sp.gr. 0.85. If the mercury differential manometer head is 250 mm, find the discharge through the venturimeter. Also find the absolute pressure at the throat if the pressure of the inlet is 49 KPa. Assume Cd = 0.98   10

3. a) Derive the expression for metacentric height with neat sketch also explain experimental procedure for determination of metacentric height.   10

b) A tank has two identical orifices in one of its vertical sides. The upper orifice is 4m below the water surface and lower one 6m below water surface. If the value for Cv for each orifice is 0.98. Find the point of intersection of two jets.   10

4. a) An internal mouthpiece of 75mm diameter is discharging water at a constant head of 8m. find the discharge through the mouthpiece when (i) the mouthpiece is running free (ii) the mouthpiece is running full   10

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b) Derive expression for discharge through a rectangular notch also, find the discharge of water flowing over a rectangular notch of 2m length when the constant head over the notch is 280mm. Take Cd = 0.60   10

5. a) Water flows over a rectangular sharp crested weir 1m long, the head over the sill of the weir being 0.66 m. The approach channel is 1.4 wide and depth of flow in the channel is 1.2 m. starting from first principles. determine the rate of discharge over the weir. Consider also the velocity of approach and the effect of end contractions. Take coefficient of discharge for the weir as 0.6.   10

b) Derive Bernoulli's equation of motion also states assumptions made with its

applications.   10

6. Write short note on

a) Types of fluids   5

b) Stability conditions for floating and submerged bodies   5

c) Classification of orifice   5

d) Total pressure and centre of pressure   5