Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.
Re-Exam jan,2020

(L)

Max. Marks: 100 | Q. P. Code:
Class: S.Y.B.Tech | Semester: III | Duration: 3 Hrs
Name of the Course: Building Drawing with CAD | Program: Civil Engineering
Course Code : ES-BTC-304

Instructions:

1. **All questions are compulsory**
2. **Make suitable assumptions where necessary and state them clearly.**

Question No		Max. Marks	Course Outcome Number	BL/PI
Q.1	It is proposed to construct G+1 RCC BUNGLOW for Electrical Engineer. Plot size is 25 M X 20 M. Requirements as below: 1. Habitable room. 2. Kitchen 3. Master Bed room 4. Children bed room 5. Guest room 6. Office & drawing room Provide staircase, toilets and other facilities like parking as per standards, a) Draw a ground floor plan b) Draw a line plan for first floor	15 05	01	2/2.1.3
Q.2	Draw a sectional elevation passing through a stair and sanitary unit for given data in Q.1	20	01	2/2.1.3
Q.3	a) Draw a site plan for given data in Q.1	10	01	2/2.1.3
	b) Draw a foundation plan for given data in Q.1	10		
Q.4	Write a short note on the following points: 1. One & two point perspective 2. Building bylaws for Fire Safety 3. Planning principle= Aspect 4. Planning principle= Economy	20	01/02	1/1.2.3
Q.5	a) Explain Real estate regulation act in detail.	10	01/02	2/2.1.3
	b)Draw a Location plan for given data in Q.1	10		

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Re- Examinations, January-2020

Q. P. Code:

Max. Marks: 100 Duration: 3 hour

Class: S.Y.B.Tech. Semester: III Program: Civil

Name of the Course: Engineering Materials Course Code : ~~PC-BTC307~~ BT-204

Instructions:

1. Question No 1 is compulsory
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams

Question No		Points	CO	BL	PI
Q1	(a) Discuss in detail Fiber glass.	4	1	2	1.3.1
	(b) Discuss the applications of Plastics in construction industry.	4	3	3	2.4.2
	(c) What do you mean by ready mixed concrete?	4	2	2	1.3.1
	(d) Explain Portland pozzolona cement.	4	3	1	1.3.1
	(e) Highlight the features of smart concrete.	4	1	4	2.3.1
Q2	(a) Explain the functions of different Geosynthetic materials used in various Civil Engineering applications.	10	2	1	2.5.1
	(b) Differentiate between: (i) Earthenware and Terracotta (ii) First class and second class brick	6	2	2	2.2.3
	(c) Where would you recommend the packing mortar and fire Resistant mortar?	4	3	3	2.4.2
Q3	(a) Draw the flow chart and explain procedure for the manufacturing of cement by wet process.	10	1	1	2.3.2
	(b) Discuss efflorescence test and compression tests performed on bricks for its suitability.	6	2	2	1.2.1
	(c) Write note on Light weight concrete.	4	2	1	2.5.1
Q4	(a) Explain chemical and electrical method of seasoning of timber.	6	1	2	2.4.2
	(b) Describe the ingredients along with function for manufacturing of the glass.	6	2	1	2.2.3
	(c) write note on (i) Cement paints (ii) Hydrophobic cement	8	3	3	1.2.1

Q5	**(a)** Explain with neat sketch (i) Perforated Brick (ii) Hollow Brick (iii) Coping Brick (iv) Queen closer	8	1	2	1.2.2
	(b) Give the comparison of Tar and Asphalt in Tabular form.	6	3	4	2.2.3
	(c) Explain creosoting and ASCU treatment to timber.	6	3	3	1.6.1
Q6	**(a)** Explain the properties and uses of materials used for thermal and sound insulation.	8	3	3	2.4.2
	(b) Explain with neat sketch Ridge tile and Mangalore tiles.	4	3	1	1.3.1
	(c) Write note on Fiber reinforced plastic	4	1	2	2.2.3
	(d) What is plywood? State its application in construction.	4	2	1,3	1.3.1
Q7	**(a)** Describe the properties and applications of any two type of (i) ferrous metals (ii) Non-ferrous metals	6	2	1,3	2.2.3
	(b) Discuss the various applications of clay products in the building industry.	5	3	3	2.4.2
	(c) Explain Cutback and Blown bitumen.	4	2	1	1.3.1
	(d) State advantages and disadvantages of timber construction.	5	1	2	3.5.5

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Re-Exam jan,2020

Max. Marks: 100 Q. P. Code:
Class: S.Y.B.Tech Semester: III Duration: 3 Hrs
Name of the Course: Building Drawing with CAD Program: Civil Engineering
Course Code : ES-BTC-304

Instructions:

1. **All questions are compulsory**
2. **Make suitable assumptions where necessary and state them clearly.**

Question No		Max. Marks	Course Outcome Number	BL/PI
Q.1	It is proposed to construct G+1 RCC BUNGLOW for Electrical Engineer. Plot size is 25 M X 20 M. Requirements as below: 1. Habitable room. 2. Kitchen 3. Master Bed room 4. Children bed room 5. Guest room 6. Office & drawing room Provide staircase, toilets and other facilities like parking as per standards, a) Draw a ground floor plan b) Draw a line plan for first floor	15 05	01	2/2.1.3
Q.2	Draw a sectional elevation passing through a stair and sanitary unit for given data in Q.1	20	01	2/2.1.3
Q.3	a) Draw a site plan for given data in Q.1	10	01	2/2.1.3
	b) Draw a foundation plan for given data in Q.1	10		
Q.4	Write a short note on the following points: 1. One & two point perspective 2. Building bylaws for Fire Safety 3. Planning principle= Aspect 4. Planning principle= Economy	20	01/02	1/1.2.3
Q.5	a) Explain Real estate regulation act in detail.	10	01/02	2/2.1.3
	b)Draw a Location plan for given data in Q.1	10		

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Re-examinations, January-2020

Q. P. Code:

Max. Marks: 100 Duration: 3 hour

Class: S.Y.B.Tech. Semester: III Program: Civil

Name of the Course: **Basics of Surveying** Course Code : **PC-BTC303**

Instructions:

1. **Question No 1 is compulsory**
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary

Question No		Points	CO	BL	PI
Q1	(a) Explain the fundamental principle of surveying.	4	1	2	1.2.1
	(b) Write a note on Local attraction.	4	3	4	2.1.2
	(c) What do you mean by balancing of sight?	4	3	2	1.2.1
	(d) Explain effect of curvature and refraction on staff readings.	4	1	1	1.2.1
	(e) What is Gale's table? How it helps in traverse computation?	4	3	2	1.3.1
Q2	(a) The bearings of the lines of a traverse are given below. Find the included angles and correct the bearings for local attraction, if any.	10	2	4	2.1.2
	(b) Describe in detail radial method of contouring.	10	1	2	2.4.2
Q3	(a) A 20 M chain was found to be 4 cm short after chaining 1760 M. It was 8 cm short at the end of days' work after chaining a total distance of 2880 M distance. If the chain was correct before commencement of work, find true distance.	05	3	4	2.1.2
	(b) Derive an expression for the curvature and refraction correction.	08	1	3	2.4.2
	(c) Explain in detail the sources of error in plane table survey.	07	2	2	2.3.1
Q4	(a) Derive an expression for zero circle of planimeter.	06	3	2	2.4.2
	(b) Following readings were observed during fly levelling. Rule out a page of field book and apply necessary checks using rise and fall method. **B.S.: 0.980 (BM, RL= 125.360m), 1.185, 0.335, 2.615, 1.395, 0.765, 2.915. F.S.: 2.725, 3.480, 1.815, 3.810, 2.415, 0.915, 1.665.**	09	1	4	2.1.2
	(c) Explain with neat sketch reciprocal ranging.	05	2	2	2.3.1

Line	AB	BC	CD	DE	EA
FB	$73^0 40'$	$113^0 50'$	$164^0 20'$	$223^0 40'$	$303^0 50'$
BB	$252^0 30'$	$295^0 20'$	$344^0 20'$	43^0	$123^0 45'$

Q5	(a) A traverse ABCDEFA was run using digital Theodolite. Balance the traverse using Bowditch rule. Also calculate independent co-ordinates. Line / Length m / corrected WCB AB / 13.88 / 80° 24' 07" BC / 18.19 / 44° 57' 42" CD / 12.70 / 80° 55' 28" DE / 13.12 / 9° 17' 28" EF / 39.40 / 271° 4' 46" FA / 30.80 / 183° 9' 4" (b) Write short notes on (i) Two peg method (ii) Orientation of Plane Table	12 08	3 1,2	4 2	2.1.2 1.2.1
Q6	(a) Explain the Reiteration method for measurement of horizontal angles. (b) Explain in detail intersection method of plane table survey. (c) The offset taken from a survey line to a boundary are given below. Find the area by Trapezoidal rule and Simpson's rule. Chainage (m): 0, 10, 20, 30, 40, 50, 60 Offset (m): 3.6, 4.9, 6.8, 7.2, 5.1, 2.9, 4.7	7 7 6	2 1 3	3 3 4	1.3.1 1.3.1 2.1.2
Q7	**(a Write short notes on** **(i)** Optical square (ii) Variation in declination (iii) Auto level (iv) Capacity of reservoir using contour (v) Testing of chain	20	1,2	2,3	2.1.2

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SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

TEST

ODD SEM JANUARY 2020

Program: S.Y. B.Tech. **Duration: 3 hours**

Course Code: BS-BTC305 **Maximum Points: 100**

Course Name: Engineering Geology **Semester: III**

Notes: Answer any 5 questions. Draw neat labeled diagrams where needed. .

Q.No.	Questions	Points	CO	BL	PI
1a	Describe the deepest layer of the Earth's structure in detail	7	CO1	L2	1.2.1
1b	Write a short note on the different types of chemical weathering with suitable examples	8	CO1	L1	1.3.1
1c	How do we know that the Earths outer core is liquid in nature?	5	CO3	L4	2.3.1
2a	Write a short note on the mineral group which is known for its vitreous luster and absence of cleavage	8	CO1	L3	1.2.1
2b	List some of the physical properties of mineral with suitable examples	7	CO1	L1	1.1.2
2c	What are the 5 key criteria a substance should meet in order to be called a mineral? What are the key physical properties of asbestos	5	CO1	L2	1.3.1
3a	Explain the different types of metamorphism	8	CO3	L2	2.1.2
3b	What inferences can be made about the environment of deposition from the physical appearance of a sedimentary rock	7	CO2	L3	2.3.1
3c	How do rocks develop porphyritic texture? Is there any relationship between grain size and rate of cooling?	5	CO2	L3	2.3.1
4a	Describe any 4 mass extinctions in detail	8	CO1	L2	1.2.1

Q.No.	Questions	Points	CO	BL	PI

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TEST

ODD SEM JANUARY 2020

4b	Write a short note on the different types of folds	7	CO2	L1	2.3.1
4c	What is the nature of the bed if the contour lines intersect the bed boundary? Write about contour lines	5	CO2	L3	1.2.1
5a	Write a detailed geological case study on the Koyna Dam	8	CO3	L2	2.3.1
5b	Describe in detail use of aerial photographs, satellite imagery, seismic and gravity survey for site investigation	7	CO3	L2	2.1.2
5c	Define: Density, Specific gravity, Unit Weight, Porosity and Absorption of a rock specimen	5	CO2	L1	1.3.1
6a	Briefly explain the zones of the water table	7	CO1	L2	2.1.2
6b	Write a short note on the types of concrete dams	8	CO2	L1	1.2.1
6c	State the importance of geological conditions while selecting site of dam or type of dam	5	CO2	L3	2.3.1
7a	Describe briefly the components and types of tunnels	8	CO1	L1	1.3.1
7b	What is the effect of the dip and strike of beds, of faults and folds on the stability of the tunnel	7	CO2	L3	2.3.1
7c	List some methods to overcome the difficulties faced during tunneling	5	CO3	L3	2.3.1

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Re- Examinations, January-2020

Q. P. Code:

Max. Marks: 100 Duration: 3 hour

Class: S.Y.B.Tech. Semester: III Program: Civil

Name of the Course: Engineering Materials Course Code : ~~PC-BTC307~~ BT-204

Instructions:

1. Question No 1 is compulsory
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams

Question No		Points	CO	BL	PI
Q1	(a) Discuss in detail Fiber glass.	4	1	2	1.3.1
	(b) Discuss the applications of Plastics in construction industry.	4	3	3	2.4.2
	(c) What do you mean by ready mixed concrete?	4	2	2	1.3.1
	(d) Explain Portland pozzolona cement.	4	3	1	1.3.1
	(e) Highlight the features of smart concrete.	4	1	4	2.3.1
Q2	(a) Explain the functions of different Geosynthetic materials used in various Civil Engineering applications.	10	2	1	2.5.1
	(b) Differentiate between: (i) Earthenware and Terracotta (ii) First class and second class brick	6	2	2	2.2.3
	(c) Where would you recommend the packing mortar and fire Resistant mortar?	4	3	3	2.4.2
Q3	(a) Draw the flow chart and explain procedure for the manufacturing of cement by wet process.	10	1	1	2.3.2
	(b) Discuss efflorescence test and compression tests performed on bricks for its suitability.	6	2	2	1.2.1
	(c) Write note on Light weight concrete.	4	2	1	2.5.1
Q4	(a) Explain chemical and electrical method of seasoning of timber.	6	1	2	2.4.2
	(b) Describe the ingredients along with function for manufacturing of the glass.	6	2	1	2.2.3
	(c) write note on (i) Cement paints (ii) Hydrophobic cement	8	3	3	1.2.1

Q5	**(a)** Explain with neat sketch (i) Perforated Brick (ii) Hollow Brick (iii) Coping Brick (iv) Queen closer	8	1	2	1.2.2
	(b) Give the comparison of Tar and Asphalt in Tabular form.	6	3	4	2.2.3
	(c) Explain creosoting and ASCU treatment to timber.	6	3	3	1.6.1
Q6	**(a)** Explain the properties and uses of materials used for thermal and sound insulation.	8	3	3	2.4.2
	(b) Explain with neat sketch Ridge tile and Mangalore tiles.	4	3	1	1.3.1
	(c) Write note on Fiber reinforced plastic	4	1	2	2.2.3
	(d) What is plywood? State its application in construction.	4	2	1,3	1.3.1
Q7	**(a)** Describe the properties and applications of any two type of (i) ferrous metals (ii) Non-ferrous metals	6	2	1,3	2.2.3
	(b) Discuss the various applications of clay products in the building industry.	5	3	3	2.4.2
	(c) Explain Cutback and Blown bitumen.	4	2	1	1.3.1
	(d) State advantages and disadvantages of timber construction.	5	1	2	3.5.5

(1).

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Re-Exam jan,2020

Max. Marks: 100
Class: S.Y.B.Tech Semester: III
Name of the Course: Building Drawing with CAD

Q. P. Code:
Duration: 3 Hrs
Program: Civil Engineering
Course Code : ES-BTC-304

Instructions:

1. **All questions are compulsory**
2. **Make suitable assumptions where necessary and state them clearly.**

Question No		Max. Marks	Course Outcome Number	BL/PI
Q.1	It is proposed to construct G+1 RCC BUNGLOW for Electrical Engineer. Plot size is 25 M X 20 M. Requirements as below: 1. Habitable room. 2. Kitchen 3. Master Bed room 4. Children bed room 5. Guest room 6. Office & drawing room Provide staircase, toilets and other facilities like parking as per standards, a) Draw a ground floor plan b) Draw a line plan for first floor	15 05	01	2/2.1.3
Q.2	Draw a sectional elevation passing through a stair and sanitary unit for given data in Q.1	20	01	2/2.1.3
Q.3	a) Draw a site plan for given data in Q.1	10	01	2/2.1.3
	b) Draw a foundation plan for given data in Q.1	10		
Q.4	Write a short note on the following points: 1. One & two point perspective 2. Building bylaws for Fire Safety 3. Planning principle= Aspect 4. Planning principle= Economy	20	01/02	1/1.2.3
Q.5	a) Explain Real estate regulation act in detail.	10	01/02	2/2.1.3
	b)Draw a Location plan for given data in Q.1	10		

(2)

SARDAR PATEL COLLEGE OF ENGINEERING

(Autonomous Institute)

Mumbai, Mumbai – 400058

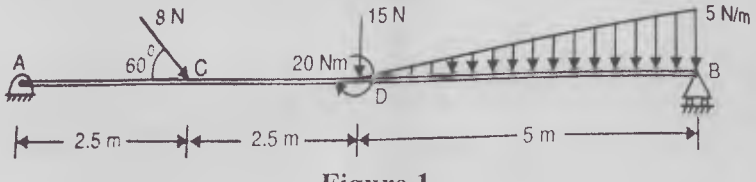
Re-Examination - January 2020

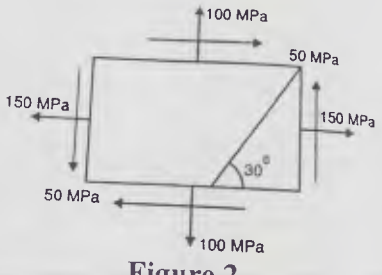
Program: S.Y. B.Tech (Civil) | **Duration: 03 hours**

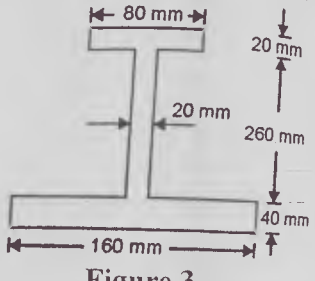
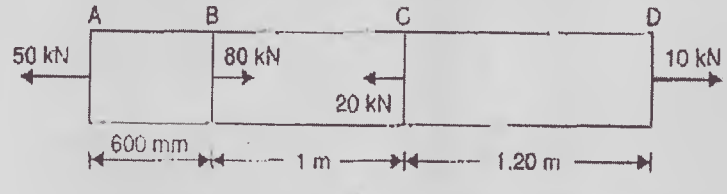
Course Code: ES-BTC 302 | **Maximum Points: 100 marks**

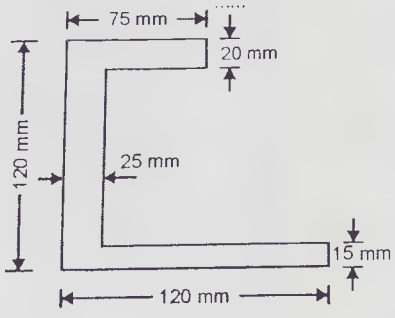
Course Name: Mechanics of Materials | **Semester: III**

Notes: 1) Attempt **any FIVE** questions out of seven questions
2) Assume suitable data wherever required and state it clearly.
3) Figures to the right indicate full marks.

Q.No.	Questions	Points	CO	BL	PI
Q1.					
a)	With the help of stress-strain curve for mild steel explain the following terms: 1. Proportional limit 2. Elastic limit 3. Yield stress 4. Strain hardening region 5. Ultimate stress Also, draw the stress-strain curve for brittle materials and explain the difference between ductile and brittle materials.	10	CO2	L4	1.3.1
b)	A compound tube consists of a steel tube of 140 mm internal diameter and 160 mm external diameter and an outer brass tube of 160 mm internal diameter and 180 mm external diameter. Both the tubes are of 1.5 m length. If the compound tube carries an axial compressive load of 900 kN, find its reduction in length. Also find the stresses and the loads carried by each tube. $E_s = 2 \times 10^5$ N/mm^2, $E_b = 1 \times 10^5$ N/mm^2.	10	CO2	L1	1.3.1, 2.1.1, 2.1.2, 2.1.3
Q2.					
a)	Draw axial force, shear force and bending moment diagram for the beam shown in figure below.  **Figure 1.**	20	CO1	L1, L3	1.3.1, 2.1.2, 2.1.3, 1.1.1

Q3.					
a)	Derive the bending equation, $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ Also state the assumptions made in the theory of pure bending (any 2).	12	CO2	L3, L4	1.3.1
b)	Prove that the maximum shear stress in triangular cross section of base 'b' and height 'h' is 1.5 times the average shear stress of the section. Also draw the shear stress distribution.	08	CO2	L1, L4	1.3.1, 2.1.1, 2.1.2 2.1.3
Q4.					
a)	A plane element is subjected to the stresses as shown in the **figure 2** below. Determine analytically: i) The principal stresses and their directions ii) The maximum shearing stresses and the directions of the plane in which they act. iii) Normal and shearing stresses on the inclined plane.  **Figure 2.**	12	CO2	L1, L3	1.3.1, 2.1.1, 2.1.2, 2.2.2, 2.2.3
b)	Solve Q.4 (a) by Mohr's Circle Method.	08	CO2	L1, L3	1.3.1, 2.1.1, 2.1.2, 2.2.2, 2.2.3
Q5.					
a)	Find the diameter of the shaft required to transmit 60 kW at 150 rpm if the maximum torque exceeds 25 % of the mean torque for a maximum permissible shear stress of 60 N/mm^2. Find also the angle of twist for a length of 4 m. Take G = 80 GPa.	10	CO2	L1, L2	1.3.1, 2.1.1, 2.1.2, 2.1.3, 2.2.2
b)	In a tensile test on mild steel bar of 20 mm diameter, the elongation in a gauge length of 100 mm was 0.072 mm when	07	CO2	L3, L4	1.3.1, 2.1.1,

	the load was 45 kN. The reduction in diameter was 0.0036 mm. Find the elastic constants 'E', 'G' and 'K'.				2.1.2, 2.1.3, 2.2.2
c)	State any three assumptions made while deriving the torsional formula.	03	CO1	L4	1.3.1
Q6.					
a)	A rod of steel 16.5 m in length is at a temperature of 27^0C. Find: i) the free expansion and the corresponding stress when it is subjected to a rise in temperature and raised to 110^0 C. ii) stress if no expansion is allowed iii) stress when the expansion of 7 mm is allowed. Take $\alpha = 12 \times 10^{-6/0}$ C, E = 220 GN/m^2.	08	CO2	L1	1.3.1, 2.1.1, 2.1.2, 2.1.3
b)	A steel I-section shown in **figure 3** below is placed to a bending moment of 24 kN-m sagging. Find : i) Location of neutral axis. ii) Moment of inertia about neutral axis iii) Maximum tensile and compressive stresses in bending. iv) Moment shared by the two flanges.  **Figure 3.**	12	CO2	L1, L2	1.3.1, 2.1.1, 2.1.2, 2.1.3
Q7.					
a)	A brass bar having cross sectional area of 1000 mm^2 is subjected to axial forces as shown in **figure 4** below. Find the total elongation of the bar if E = 1.05×10^5 N/mm^2.  **Figure 4.**	10	CO2	L3, L4	1.3.1, 2.1.1, 2.1.2, 2.1.3, 2.2.2

b)	**Figure 5** below shows a 'C' section subjected to a shear force of 18 kN. Sketch the shear stress distribution across the section.  **Figure 5.**	10	CO2	L1, L2	1.3.1, 2.1.1, 2.1.2, 2.1.3

**********GOOD LUCK**********

(L)

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W), Mumbai – 400058

Re-Examinations (January 2020)
Civil Engineering

Program: UG Civil Engineering **Duration: 3 hour**

Course Code: PC-BTC-306 **Maximum Points: 100**

Course Name: Fluid Mechanics **Semester: III**

Instructions:

1. Attempt *Any Five* questions
2. All questions carry equal marks
3. Answer to each question to be started on the fresh page
4. Assume suitable data if necessary and mention it clearly
5. Draw neat diagrams

Q.No.	Questions	Points	CO	BL	PI
1	(a) Explain classification of fluids based on viscosity	10	1	2	1.2.1
	(b) Explain the term surface tension and capillarity. What would be the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in water, if surface tension of water 0.0735 N/m and the angle of contact for water and glass is zero?	10	1	4	2.1.2
2	(a)Define and Explain the terms absolute, gauge, atmospheric and vacuum pressure.	10	1	2	2.1.1
	(b) Find the equivalent pressure head of 90 meter of water in terms of: (i) Kerosene of specific gravity of 0.82; and (ii) Glycerin of specific gravity of 1.26.	10	1	4	2.4.1
3	(a) State and prove Pascal law's law.	10	1	4	2.1.1
	(b) A circular plate 4.5 meter diameter is immersed in water in such a way that it's greatest and least depth below the free surface is 5 meter and 2.5 meter respectively. Determine the total pressure on one face of the plate and position of centre of pressure.	10	1	3	2.4.1
4	(a) Discuss equilibrium conditions of a floating body.	10	1	1	2.1.1
	(b) A wooden block of rectangular section 1.30 meter wide, 2.25 meter deep and 4.50 long floats horizontally in sea water. If the specific gravity of wood is 0.65 and water weighs 1025 kg/m^3; find the volume of liquid displaced and the position of the centre of buoyancy.	10	1	3	2.3.1

5	(a) State the examples for each of the following: (i)Steady flow and Unsteady flow and (ii) Uniform flow and Non-Uniform flow.	10	2	1	1	1
	(b) State whether the velocity components of u = (2x/t), v = -(y/t) and w = - (z/t) represents a possible case of steady and irrotational flow.	10	2	1	1	1
6	(a) Derive Euler's equation of motion.	10	2	1	1	1
	(b) A 30 cm x 15 cm Venturimeter discharges 0.80 m3/sec of oil of specific gravity 0.90. Calculate the pressure at throat section for an inlet pressure of 210 kPa. Take Cd of meter as 0.98.	10	2	1	1	1
7	(a)Explain with neat sketch: Boundary layer theory.	10	3	1	1	1
	(b) Derive Hagen-Poiseuille equation for laminar flow in the circular pipes.	10	3	1	1	1

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

Re Examinations- January 2020

Program: Civil Engineering
Course Code: BS-BTC301
Course Name: Engineering Mathematics III

Duration: 3 hours
Maximum Points: 100
Semester: III

Instructions:
1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six

Q.No.	Questions	Points	CO	BT	PI
1(a)	Prove that $\int_0^{\infty}\left(\frac{\sin 2t+\sin 3t}{te^t}\right)dt=\frac{3\pi}{4}$	6	1	ii, iii	1.1 .1
(b)	Show that the transformation $w=\frac{2z+3}{z-4}$ maps the circle $x^2+y^2-4x=0$ into the straight line $4u+3=0$ in the w-plane	6	2	iv, v	2.4 .1
(c)	Let A be a square matrix of order 3×3 with $\lvert A\rvert=1$. If $\lambda=\frac{-1+i\sqrt{3}}{2}$ is one of the eigen values of A, (i) Find all the eigen values of A (ii) If $A^{100}=pA^2+qA+rI$, find p,q and r	8	3	ii, v	2.4 .1
2(a)	If $L\{erf\sqrt{t}\}=\frac{1}{s\sqrt{s+1}}$, find $L\{te^{3t}erf(2\sqrt{t})\}$	6	1	i, ii	2.4 .1
(b)	If function $f(z)$ is analytic and $\lvert f(z)\rvert$ is constant, prove that $f(z)$ is constant	6	2	ii, iii	1.1 .1

(c)	Find Eigen Values and corresponding Eigen Vectors of the matrix $A=\begin{bmatrix}-2 & -8 & -12\\ 1 & 4 & 4\\ 0 & 0 & 1\end{bmatrix}$	8	3	ii, iii	1.1 .1
3(a)	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix}3 & 3 & 6 & 1\\ 1 & 6 & 4 & 2\\ 7 & 9 & 10 & 3\end{bmatrix}$	6	3	i, ii	2.4 .1
(b)	Using method of Laplace Transforms solve following differential equation $(D^2-D-2)y=\sin 2t$ where $y(0)=1,\ y'(0)=2$	6	1	ii, iii	2.4 .1
(c)	Prove that the function $u=e^x\left(x\cos y-y\sin y\right)$ is harmonic. find its harmonic conjugate and corresponding analytic function	8	2	iv, v	1.1 .1
4(a)	Find the image of the circle $\lvert z-2\rvert=2$ under the transformation $\frac{1}{z}$	6	2	i, ii	1.1 .1
(b)	Prove that $L\left\{\sin\sqrt{t}\right\}=\frac{\sqrt{\pi}}{2s^{3/2}}e^{-1/4s}$	6	1	iv, v	2.1 .1
(c)	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form where $A=\begin{bmatrix}3 & 1 & 1\\ -1 & 5 & -1\\ 1 & -1 & 3\end{bmatrix}$. Hence find A^{-1}	8	3	ii, iii	2.4 .1

5(a)	If u and v are conjugate harmonic functions, prove that uv is also harmonic.	6	2	i, ii	2.4 .1
(b)	Using Cayley Hamilton Theorem, Find inverse of the matrix $A=\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$	6	3	ii, iii	2.4 .1
(c)	Evaluate (i) $L^{-1}\left\{\dfrac{2s^2+5s+3}{(s-1)^4}\right\}$ (ii) $L^{-1}\left\{\log\left(1+\dfrac{1}{s}\right)\right\}$	8	1	iv, v	1.1 .1
6(a)	Find an analytic function $f(z)=u(x,y)+iv(x,y)$ if $v=e^{-x}\left[2xy\cos y+\left(y^2-x^2\right)\sin y\right]$	6	2	ii, v	1.1 .1
(b)	Find Eigen values of the matrix $A=\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$	6	3	iv, v	2.4 .1
(c)	Find the bilinear transformation which maps the points $2, i, -2$ of $z-$plane onto $1, i, -1$ of $w-$plane respectively	8	2	i, ii	1.1 .1
7(a)	Show that the transformation $w=\dfrac{5-4z}{4z-2}$ transforms the circle $\lvert z\rvert=1$ into a circle in the w-plane.	6	2	i, ii	1.1 .1
(b)	Test the consistency of the following system of equations and solve them if they are consistent $4x-2y+6z=8$ $x+y-3z=-1$ $15x-3y+9z=21$	6	3	ii, iii	2.4 .1
(c)	Evaluate $L^{-1}\left\{\dfrac{s}{s^4+4}\right\}$	8	1	ii, v	1.1 .1

(1)

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

TEST

ODD SEM JANUARY 2020

Program: S.Y. B.Tech.
Course Code: BS-BTC305
Course Name: Engineering Geology

Duration: 3 hours
Maximum Points: 100
Semester: III

Notes: Answer any 5 questions. Draw neat labeled diagrams where needed. .

Q.No.	Questions	Points	CO	BL	PI
1a	Describe the deepest layer of the Earth's structure in detail	7	CO1	L2	1.2.1
1b	Write a short note on the different types of chemical weathering with suitable examples	8	CO1	L1	1.3.1
1c	How do we know that the Earths outer core is liquid in nature?	5	CO3	L4	2.3.1
2a	Write a short note on the mineral group which is known for its vitreous luster and absence of cleavage	8	CO1	L3	1.2.1
2b	List some of the physical properties of mineral with suitable examples	7	CO1	L1	1.1.2
2c	What are the 5 key criteria a substance should meet in order to be called a mineral? What are the key physical properties of asbestos	5	CO1	L2	1.3.1
3a	Explain the different types of metamorphism	8	CO3	L2	2.1.2
3b	What inferences can be made about the environment of deposition from the physical appearance of a sedimentary rock	7	CO2	L3	2.3.1
3c	How do rocks develop porphyritic texture? Is there any relationship between grain size and rate of cooling?	5	CO2	L3	2.3.1
4a	Describe any 4 mass extinctions in detail	8	CO1	L2	1.2.1

Q.No.	Questions	Points	CO	BL	PI

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

TEST

ODD SEM JANUARY 2020

4b	Write a short note on the different types of folds	7	CO2	L1	2.3.1
4c	What is the nature of the bed if the contour lines intersect the bed boundary? Write about contour lines	5	CO2	L3	1.2.1
5a	Write a detailed geological case study on the Koyna Dam	8	CO3	L2	2.3.1
5b	Describe in detail use of aerial photographs, satellite imagery, seismic and gravity survey for site investigation	7	CO3	L2	2.1.2
5c	Define: Density, Specific gravity, Unit Weight, Porosity and Absorption of a rock specimen	5	CO2	L1	1.3.1
6a	Briefly explain the zones of the water table	7	CO1	L2	2.1.2
6b	Write a short note on the types of concrete dams	8	CO2	L1	1.2.1
6c	State the importance of geological conditions while selecting site of dam or type of dam	5	CO2	L3	2.3.1
7a	Describe briefly the components and types of tunnels	8	CO1	L1	1.3.1
7b	What is the effect of the dip and strike of beds, of faults and folds on the stability of the tunnel	7	CO2	L3	2.3.1
7c	List some methods to overcome the difficulties faced during tunneling	5	CO3	L3	2.3.1

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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

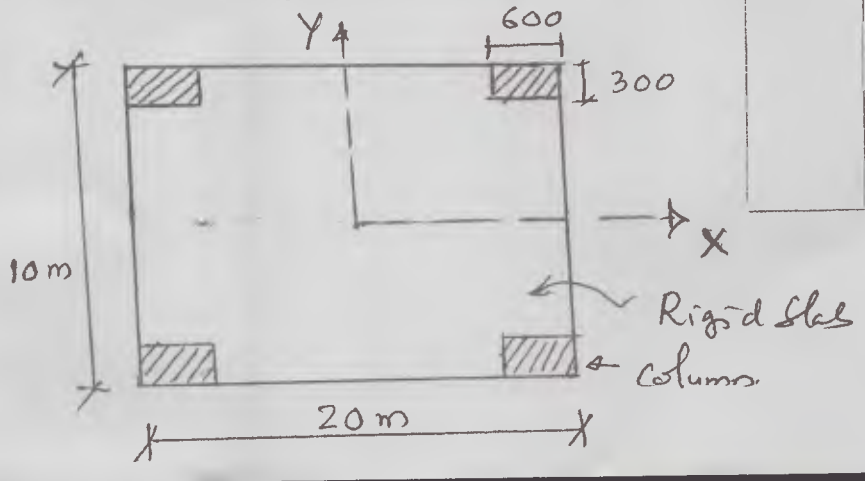
(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.
RE Examination
January - 2020

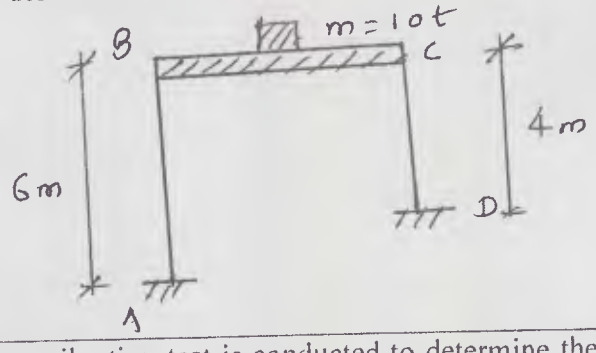
Max. Marks: 100 | Duration: 3 Hours
Class: M.Tech. | Semester: III | Program: Civil Engineering
Name of the Course: Earthquake Engineering | Course Code : EC-MST 301

Instructions:

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.
- Assume suitable data if necessary and state the same clearly

Question No		Points	CO	BL	PI
Q1 (a)	Answer the followings: (i) Explain clearly, the difference between static and dynamic analysis of structure	3	3	1,2	1.2.1
	(ii) What is an earthquake? How the earthquakes are classified based on their causes?	3	2	1,2	
	(iii) Explain the different types of seismic waves and their characteristics	4	2	2	
Q1 (b)	(i) A uniform rigid slab of total mass 25 t is supported by four columns of height 8.0 m. rigidly connected to the top of slab and fixed at bottom. Each column is rectangular section of 750 mm x 300 mm as shown in figure. If the system is subjected to harmonic ground motion of amplitude 0.3g at frequency of 10 rad/sec in X direction only, calculate the maximum lateral displacement of slab in X direction and maximum stress in each column $\zeta = 5\%$ and E = 20, 000 MPa.	4	3	3	1.2.1
	(ii) In the above problem, If the columns are hinged at bottom, then calculate the maximum lateral displacement of slab in X direction and maximum stress in each column. Comment on the effect of fixity of column on these parameters	3	3	3	

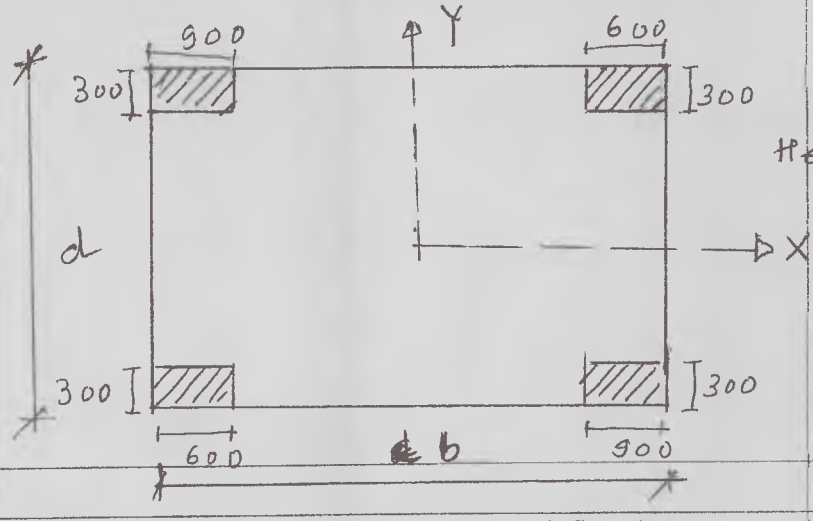


Q1 (c).	Explain the characteristics of ground motions	3	2	3	
Q2 (a)	A one story RCC building is idealized as plane frame as shown in figure. The cross section of columns is 250 mm x 250 mm and E= 20,000 Mpa. If the building is to be designed for ground motion, the response spectrum of which is shown in figure1. Determine the design values of lateral deformation and bending moments in the columns for the following two conditions: **(i)** Supports of columns are fixed. **(ii)** If the columns of the frame are hinged at base. Comment on the influence of base fixity on the design deformation and bending moments 	4 4	3 3	3 3	1.3.1, 1.4.1
Q2 (b)	A free vibration test is conducted to determine the dynamic properties of a one storey building. The mass of the building is 10t. Initial displacement of the building is 60 mm. Maximum displacement on the first cycle is 40 mm and period of displacement cycle is 1.5 sec. Determine: (i) Un damped frequency (ii) Logarithmic decrement (iii) Damping ratio (iv) Damping coefficient (v) Amplitude after 6 cycles.	5	3	3	1.3.1, 1.4.1
Q2 (c)	A two storey frame has the following free vibration characteristics. The frame is subjected to a harmonic force of 100 Kn at 2nd floor level with frequency of 20 rad/sec. Assume damping ratio ξ = 5%. Calculate the upper bound on response of each floor.	7	3	3	2.4.1

Floor No.	Mass (t)	Mode No.	ω, rad/sec	Mode shapes	
				Φ_{i1}	Φ_{i2}
1	20	1	14.58	1.0	1.481
2	15	2	38.07	1.0	-0.822

Q3 — The plan of one story building is as shown in figure. The structure consists of a roof idealized as a rigid diaphragm, supported on four corner columns as shown in figure. The roof weight is uniformly distributed and has magnitude 200 kg/m^2. The plan dimensions are b= 30 m d=20m — **1.3.1, 1.4.1**

(i) Derive the stiffness matrix and determine the natural frequencies and modes shapes of vibrations of the structure	**10**	**3**	**3**
(ii) If the structure is subjected to ground motion only in x direction. write down the equations of motion for the system	**2**	**5**	**2**
(iii)As a special case, if all columns are of the same size, 300 mm x 600 mm, and if the system is subjected to the ground motion only in X direction, the response spectrum of which is shown in figure1. Determine the design value of lateral deformation, base shear and bending moment for the system.	**8**	**5**	**3**



Height of building is 8m

E = 20,000 MPa

Q4 (a)	What is response spectrum? Explain briefly, the response spectrum characteristics.	**5**	**4**	**3**
Q4 (b)	Explain the procedure to construct elastic response spectrum for a single ground motion record.	**6**	**4**	**3**

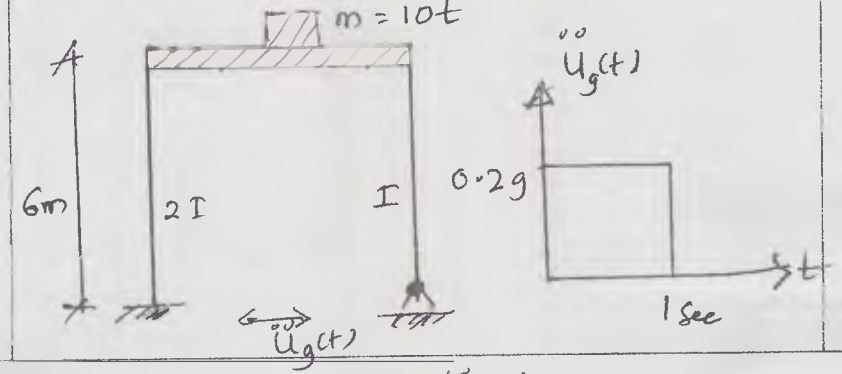
A two story frame has the following free vibration characteristics. The frame is to be designed for the ground motion characterized by the design spectrum given in the figure 1 but scaled to peak ground acceleration of **0.2g**. Calculate the design values of lateral deformation of floors. — **9** | **5** | **3** | **2.3.1 2.4.1**

Floor No.	Mass (t)	Mode No.	ω, rad/sec	Mode shapes	
				Φ_{i1}	Φ_{i2}
1	20	1	14.58	1.0	1.481
2	15	2	38.07	1.0	-0.822

Q5 (a)	Explain the various types of Irregular Buildings as per IS 1893-2016	4	6	2	2.12.
Q5 (b)	As per IS 1893-2016, how many mode need to be considered in the earthquake force calculation by Response Spectrum Method	2	6	2	2.12
Q5 (c)	State the limitation of Equivalent static Method. As per IS 1893-2016, under what conditions the Equivalent static Method is permitted to use to calculate the earthquake forces.	2	6	2	2.4.1
Q5 (d)	Using response spectrum method, calculate the seismic force on each floor of the frame whose pre vibration properties are given below. Use the following additional data: Z=0.24, I =1.5, R=5.0 and ξ = 5%. Assume foundation strata as soft and use response spectrum given in figure 2.	12	5,6	4	2.12

Story No.	Mass No.	Mass (t)	ω rad/sec	Mode shapes		
				Φ_{i1}	Φ_{i2}	Φ_{i3}
1	1	25	15.73	0.399	0.747	1.0
2	2	25	49.85	1.0	0.727	-0.471
3	3	25	77.82	-0.908	1.0	-0.192

Q 6(a)	Explain the following with reference to SDOF systems: (i) Allowable Ductility (ii) Ductility Demand	4	6	2	2.4.1
Q 6(b)	Define the followings: (i) Joint probability distribution (ii) Stationary random process (iii) Power spectral density function (iv) Auto correlation function.	4	1	1	2.4.1
Q 6(c)	Briefly explain the following: (i) Structure of Earth (ii) Magnitude and Intensity of an earthquake	6	2	2	2.4.1
Q 6(d)	A single story frame shown in figure is subjected to ground motion as shown. Determine the maximum displacement at girder level, base shear and bending moments in column.	6	3	3	2.3 2.4.1



$E = 2 \times 10^5 \ N/mm^2$

$I = 20,000 \ cm^4$

Q 7(a)	What is ductility of a structure? Explain the importance of ductility in seismic resistant structures.	3	6	2	2.4.1
Q 7(b)	What is shear Wall? Explain the advantages of shear walls for earthquake resistant structure.	3	6	2	2.4.1
Q 7(c)	Explain the provisions of IS 13920 for (i)Beams: General provisions, longitudinal reinforcement and web reinforcement (ii)Shear wall: General requirements, longitudinal and transverse reinforcement.	12	6	2	2.4.1
Q 7(d)	Briefly explain the different types of structural systems used in a building structure to resist lateral loads due earthquake	2	6	2	2.2.1

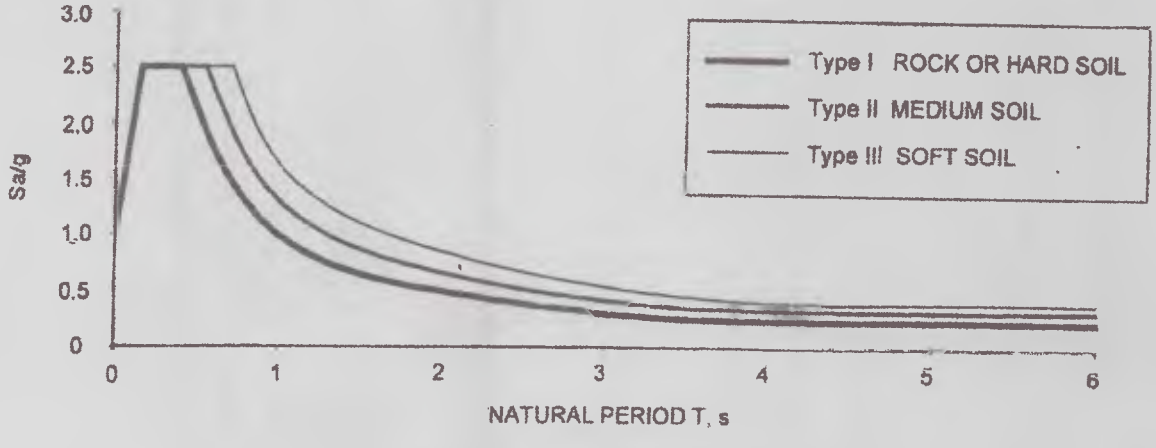


FIG. 2 DESIGN ACCELERATION COEFFICIENT (S_a/g) (CORRESPONDING TO 5 PERCENT DAMPING)

Figure 2.

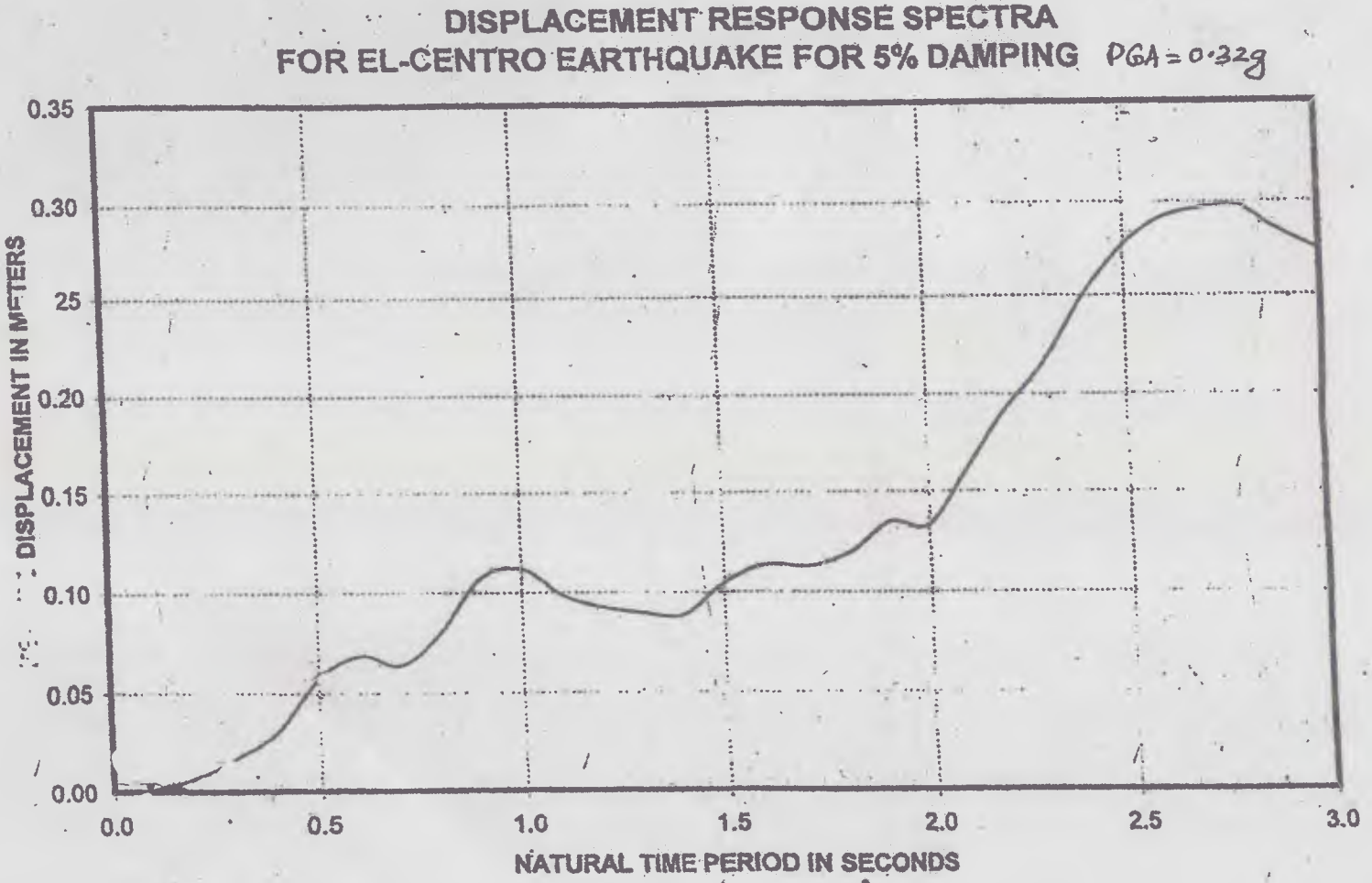

DISPLACEMENT RESPONSE SPECTRA
FOR EL-CENTRO EARTHQUAKE FOR 5% DAMPING PGA = 0.32g
DISPLACEMENT IN METERS
0.35
0.30
25
0.20
0.15
0.10
0.05
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
NATURAL TIME PERIOD IN SECONDS

Figure 1

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai 400058

Re Examinations (For Academic Year 2018-19)- January 2020

Program: Civil Engineering
Course Code: BS-BTC301
Course Name: Engineering Mathematics III

Duration: 3 hours
Maximum Points: 100
Semester: III

Instructions:
1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.

Q.No.	Questions	Points
1(a)	Prove that $\int_0^{\infty}\left(\frac{\sin 2t+\sin 3t}{te^t}\right)dt=\frac{3\pi}{4}$	6
(b)	Show that the transformation $w=\frac{2z+3}{z-4}$ maps the circle $x^2+y^2-4x=0$ into the straight line $4u+3=0$ in the w-plane	6
(c)	Let A be a square matrix of order 3×3 with $\lvert A\rvert=1$. If $\lambda=\frac{-1+i\sqrt{3}}{2}$ is one of the eigen values of A, (i) Find all the eigen values of A (ii) If $A^{100}=pA^2+qA+rI$, find p,q and r	8
2(a)	If $L\{erf\sqrt{t}\}=\frac{1}{s\sqrt{s+1}}$, find $L\{te^{3t}erf(2\sqrt{t})\}$	6
(b)	If function $f(z)$ is analytic and $\lvert f(z)\rvert$ is constant, prove that $f(z)$ is constant	6
(c)	Find Eigen Values and corresponding Eigen Vectors of the matrix $A=\begin{bmatrix}-2 & -8 & -12\\ 1 & 4 & 4\\ 0 & 0 & 1\end{bmatrix}$	8

3(a)	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix} 8 & 3 & 6 & 1 \\ -1 & 6 & 4 & 2 \\ 7 & 9 & 10 & 3 \end{bmatrix}$	6
(b)	Using method of Laplace Transforms solve following differential equation $(D^2-D-2)y=\sin 2t$ where $y(0)=1,\ y'(0)=2$	6
(c)	Prove that the function $u=e^x(x\cos y-y\sin y)$ is harmonic. find its harmonic conjugate and corresponding analytic function	8
4(a)	Find the image of the circle $\lvert z-2\rvert=2$ under the transformation $\frac{1}{z}$	6
(b)	Prove that $L\left\{\sin\sqrt{t}\right\}=\frac{\sqrt{\pi}}{2s^{3/2}}e^{-1/4s}$	6
(c)	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form where $A=\begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. Hence find A^{-1}	8
5(a)	If u and v are conjugate harmonic functions, prove that uv is also harmonic.	6
(b)	Using Cayley Hamilton Theorem, Find inverse of the matrix $A=\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$	6
(c)	Evaluate (i) $L^{-1}\left\{\frac{2s^2+5s+2}{(s-1)^3}\right\}$ (ii) $L^{-1}\left\{\log\left(1+\frac{4}{s^2}\right)\right\}$	8

6(a)	Find an analytic function $f(z)=u(x,y)+iv(x,y)$ if $v=e^{-x}\left[2xy\cos y+\left(y^2-x^2\right)\sin y\right]$	6
(b)	Find Eigen values of the matrix $A=\begin{bmatrix}\cos\theta & \sin\theta & 0\\ -\sin\theta & \cos\theta & 0\\ 0 & 0 & 1\end{bmatrix}$	6
(c)	Find the bilinear transformation which maps the points [illegible] of z-plane onto [illegible] of w-plane respectively	8
7(a)	Show that the transformation $w=\dfrac{5-4z}{4z-2}$ transforms the circle $\lvert z\rvert=1$ into a circle in the w-plane.	6
(b)	Test the consistency of the following system of equations and solve them if they are consistent $4x-2y+6z=8$ $x+y-3z=-1$ $15x-3y+9z=21$	6
(c)	Evaluate $L^{-1}\left\{\dfrac{s}{s^4+4}\right\}$	8

(4)

SARDAR PATEL COLLEGE OF [illegible]GINEERING

(Government Aided Autonomous Ins[illegible])
Munshi Nagar, Andheri (W) Mumbai [illegible]

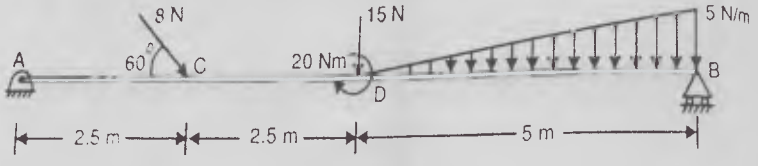
Re- Examination - January 2020

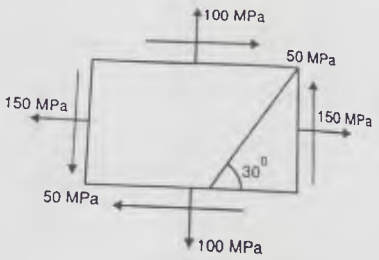
Program: S.Y. B.Tech (Civil) | **Duration: 03 hours**

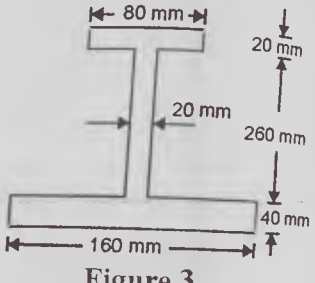
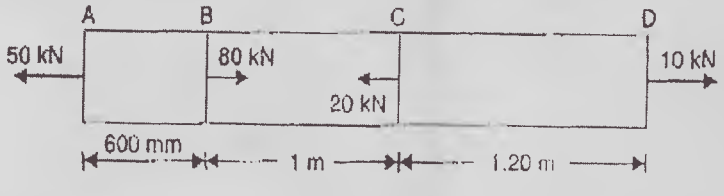
Course Code: ES-BTC 302 | **Maximum Points: 100 marks**

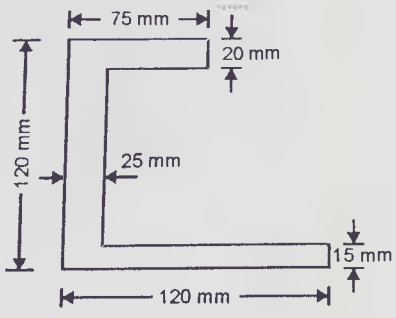
Course Name: Mechanics of Materials | **Semester: III**

Notes: 1) Attempt **any FIVE** questions out of seven questions
2) Assume suitable data wherever required and state it clearly.
3) Figures to the right indicate full marks.

Q.No.	Questions	Points	CO	BL	PI
Q1.					
a)	With the help of stress-strain curve for mild steel explain the following terms: 1. Proportional limit 2. Elastic limit 3. Yield stress 4. Strain hardening region 5. Ultimate stress Also, draw the stress-strain curve for brittle materials and explain the difference between ductile and brittle materials.	10	CO2	L4	1.3.1
b)	A compound tube consists of a steel tube of 140 mm internal diameter and 160 mm external diameter and an outer brass tube of 160 mm internal diameter and 180 mm external diameter. Both the tubes are of 1.5 m length. If the compound tube carries an axial compressive load of 900 kN, find its reduction in length. Also find the stresses and the loads carried by each tube. $E_s = 2 \times 10^5$ N/mm^2, $E_b = 1 \times 10^5$ N/mm^2.	10	CO2	L1	1.3.1, 2.1.1, 2.1.2, 2.1.3
Q2.					
a)	Draw axial force, shear force and bending moment diagram for the beam shown in figure below.  **Figure 1.**	20	CO1	L1, L3	1.3.1, 2.1.2, 2.1.3, 1.1.1

Q3.					
a)	Derive the bending equation, $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ Also state the assumptions made in the theory of pure bending (any 2).	12	CO2	L3, L4	1.3.1
b)	Prove that the maximum shear stress in triangular cross section of base 'b' and height 'h' is 1.5 times the average shear stress of the section. Also draw the shear stress distribution.	08	CO2	L1, L4	1.3.1, 2.1.1, 2.1.2 2.1.3
Q4.					
a)	A plane element is subjected to the stresses as shown in the **figure 2** below. Determine analytically: i) The principal stresses and their directions ii) The maximum shearing stresses and the directions of the plane in which they act. iii) Normal and shearing stresses on the inclined plane.  **Figure 2.**	12	CO2	L1, L3	1.3.1, 2.1.1, 2.1.2, 2.2.2, 2.2.3
b)	Solve Q.4 (a) by Mohr's Circle Method.	08	CO2	L1, L3	1.3.1, 2.1.1, 2.1.2, 2.2.2, 2.2.3
Q5.					
a)	Find the diameter of the shaft required to transmit 60 kW at 150 rpm if the maximum torque exceeds 25 % of the mean torque for a maximum permissible shear stress of 60 N/mm^2. Find also the angle of twist for a length of 4 m. Take G = 80 GPa.	10	CO2	L1, L2	1.3.1, 2.1.1, 2.1.2, 2.1.3, 2.2.2
b)	In a tensile test on mild steel bar of 20 mm diameter, the elongation in a gauge length of 100 mm was 0.072 mm when	07	CO2	L3, L4	1.3.1, 2.1.1,

	the load was 45 kN. The reduction in diameter was 0.0036 mm. Find the elastic constants 'E', 'G' and 'K'.				2.1.2, 2.1.3, 2.2.2
c)	State any three assumptions made while deriving the torsional formula.	03	CO1	L4	1.3.1
Q6.					
a)	A rod of steel 16.5 m in length is at a temperature of 27^0C. Find: i) the free expansion and the corresponding stress when it is subjected to a rise in temperature and raised to 110^0 C. ii) stress if no expansion is allowed iii) stress when the expansion of 7 mm is allowed. Take $\alpha = 12 \times 10^{-6/0}$ C, E = 220 GN/m^2.	08	CO2	L1	1.3.1, 2.1.1, 2.1.2, 2.1.3
b)	A steel I-section shown in **figure 3** below is placed to a bending moment of 24 kN-m sagging. Find : i) Location of neutral axis. ii) Moment of inertia about neutral axis iii) Maximum tensile and compressive stresses in bending. iv) Moment shared by the two flanges.  **Figure 3.**	12	CO2	L1, L2	1.3.1, 2.1.1, 2.1.2, 2.1.3
Q7.					
a)	A brass bar having cross sectional area of 1000 mm^2 is subjected to axial forces as shown in **figure 4** below. Find the total elongation of the bar if E = 1.05×10^5 N/mm^2.  **Figure 4.**	10	CO2	L3, L4	1.3.1, 2.1.1, 2.1.2, 2.1.3, 2.2.2

b)	**Figure 5** below shows a 'C' section subjected to a shear force of 18 kN. Sketch the shear stress distribution across the section.  **Figure 5.**	10	CO2	L1, L2	1.3.1, 2.1.1, 2.1.2, 2.1.3

**********GOOD LUCK**********

(2)

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

Re Examinations- January 2020

Program: Civil Engineering
Course Code: BS-BTC301
Course Name: Engineering Mathematics III

Duration: 3 hours
Maximum Points: 100
Semester: III

Instructions:
1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.

Q.No.	Questions	Points	CO	BL	PI
1(a)	Prove that $\int_0^{\infty}\left(\frac{\sin 2t+\sin 3t}{te^t}\right)dt=\frac{3\pi}{4}$	6	1	ii, iii	1.1 .1
(b)	Show that the transformation $w=\frac{2z+3}{z-4}$ maps the circle $x^2+y^2-4x=0$ into the straight line $4u+3=0$ in the w-plane	6	2	iv, v	2.4 .1
(c)	Let A be a square matrix of order 3×3 with $\lvert A\rvert=1$. If $\lambda=\frac{-1+i\sqrt{3}}{2}$ is one of the eigen values of A, (i) Find all the eigen values of A (ii) If $A^{100}=pA^2+qA+rI$, find p,q and r	8	3	ii, v	2.4 .1
2(a)	If $L\{erf\sqrt{t}\}=\frac{1}{s\sqrt{s+1}}$, find $L\{te^{3t}erf(2\sqrt{t})\}$	6	1	i, ii	2.4 .1
(b)	If function $f(z)$ is analytic and $\lvert f(z)\rvert$ is constant, prove that $f(z)$ is constant	6	2	ii, iii	1.1 .1

(c)	Find Eigen Values and corresponding Eigen Vectors of the matrix $A=\begin{bmatrix}-2 & -8 & -12\\ 1 & 4 & 4\\ 0 & 0 & 1\end{bmatrix}$	8	3	ii, iii	1.1 .1
3(a)	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix}3 & 3 & 6 & 1\\ -1 & 6 & 4 & 2\\ 7 & 9 & 10 & 3\end{bmatrix}$	6	3	i, ii	2.4 1
(b)	Using method of Laplace Transforms solve following differential equation $(D^2-D-2)y=\sin 2t$ where $y(0)=1,\ y'(0)=2$	6	1	ii, iii	2.4 .1
(c)	Prove that the function $u=e^x(x\cos y-y\sin y)$ is harmonic. find its harmonic conjugate and corresponding analytic function	8	2	iv, v	1.1 .1
4(a)	Find the image of the circle $\lvert z-2\rvert=2$ under the transformation $\frac{1}{z}$	6	2	i, ii	1.1 .1
(b)	Prove that $L\{\sin\sqrt{t}\}=\frac{\sqrt{\pi}}{2s^{3/2}}e^{-1/4s}$	6	1	iv, v	2.4 .1
(c)	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form where $A=\begin{bmatrix}3 & 1 & 1\\ -1 & 5 & -1\\ 1 & -1 & 3\end{bmatrix}$. Hence find A^{-1}	8	3	ii, iii	2.4 .1

5(a)	If u and v are conjugate harmonic functions, prove that uv is also harmonic.	6	2	i, ii	2.4 .1
(b)	Using Cayley Hamilton Theorem, Find inverse of the matrix $A=\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$	6	3	ii, iii	2.4 .1
(c)	Evaluate (i) $L^{-1}\left\{\frac{3s^2+5s+2}{(s-1)}\right\}$ (ii) $L^{-1}\left\{\log\left(1+\frac{1}{s^2}\right)\right\}$	8	1	iv	1.1 .1
6(a)	Find an analytic function $f(z)=u(x,y)+iv(x,y)$ if $v=e^{-x}\left[2xy\cos y+\left(y^2-x^2\right)\sin y\right]$	6	2	ii, v	1.1 .1
(b)	Find Eigen values of the matrix $A=\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$	6	3	iv, v	2.4 .1
(c)	Find the bilinear transformation which maps the points $2, i, -2$ of $z-$plane onto $1, i, -1$ of $w-$plane respectively	8	2	i, ii	1.1 .1
7(a)	Show that the transformation $w=\frac{5-4z}{4z-2}$ transforms the circle $\lvert z\rvert=1$ into a circle in the w-plane.	6	2	i, ii	1.1 .1
(b)	Test the consistency of the following system of equations and solve them if they are consistent $4x-2y+6z=8$ $x+y-3z=-1$ $15x-3y+9z=21$	6	3	ii, iii	2.4 .1
(c)	Evaluate $L^{-1}\left\{\frac{s}{s^4+4}\right\}$	8	1	ii, v	1.1 .1