B.Arch. Degree I & II Semester Examination April 2019

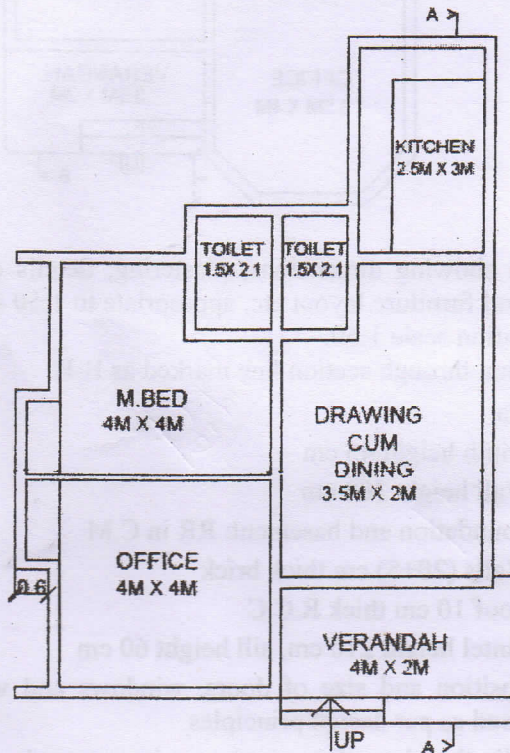## AR 1101 ARCHITECTURAL DESIGN I

(2014 Scheme)

Time: 4 Hours   Maximum Marks: 100

Instructions: (i)   One drawing sheet of approximate A1 size and two rough tracing butter sheets must be supplied.
(ii)   Answer any one question in full. Each full question carries 100 marks.
(iii)   Drawing should be dimensioned as per standards, labeled in good lettering and rendered appropriately.
(iv)   Importance will be given to drafting quality, accuracy of drawing and for conformity with standard design and drafting principles.
(iv)   Drawing may be rendered as per architectural standards.

I.   Prepare a neatly drafted, detailed technical drawing of a residence; key plan is given in figure. Minor variation in plan is permissible, if necessary.

(a)   Floor plan showing dimensions, plastering, details of doors, windows,   (60)
furniture and furniture layout etc. appropriate to 1:50 scale.
(b)   Front elevation scale 1:50.   (20)
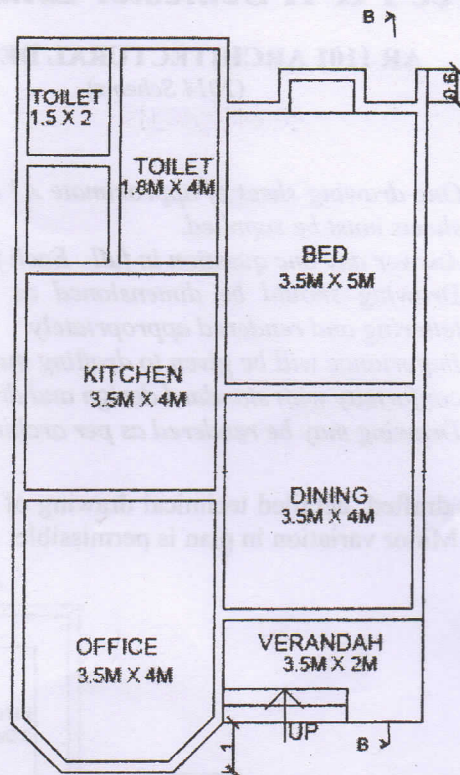(c)   Cross section through section line marked as A-A.   (20)

Design data:
(i)   Plinth height 45 cm
(ii)   Wall height 300 cm
(iii)   Foundation and basement: RR in C.M
(iv)   Walls (20+5) cm thick brick
(v)   Roof 10 cm thick R.C.C
(vi)   Lintel height 210 cm
(vii) Position and size of doors, windows and ventilators may be fixed as per design principles
(viii) All other data, if required, may be assumed

OR

(P.T.O.)

II. Prepare neatly drafted, detailed technical drawing of a residence, key plan is given in figure. Minor variation in plan is permissible, if necessary.

(a) Floor plan showing dimensions, plastering, details of doors, windows, furniture and furniture layout etc. appropriate to 1:50 scale. (60)

(b) Front elevation scale 1:50. (20)

(c) Cross section through section line marked as B-B. (20)

Design data:

(i) Plinth height 45 cm

(ii) Wall height 300 cm

(iii) Foundation and basement: RR in C.M

(iv) Walls (20+5) cm thick brick

(v) Roof 10 cm thick R.C.C

(vi) Lintel height 210 cm, sill height 60 cm

(vii) Position and size of doors, windows and ventilators may be fixed as per design principles

(viii) All other data, if required, may be assumed

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C

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AR 1102 BUILDING MATERIALS AND CONSTRUCTION I
(2014 Scheme)

Time : 4 Hours   Maximum Marks : 100

PART A

(8 × 5 = 40)

I.   Write short notes on the following :
  (a)   Ingredients of P.C.C
  (b)   Components of a building
  (c)   Ashlar Masonry
  (d)   Rat-trap bond
  (e)   Properties of timber
  (f)   Application of bamboo as building material
  (g)   Pivoted windows
  (h)   Different types of bolts used in doors and windows

(2 × 10 = 20)

II.   Explain the properties, available sizes and uses of bricks.
OR
III.   Explain cement mortar, lime mortar and gauged mortar. What are the proportions of cement mortar for various works?

IV.   Explain the various defects in timber.
OR
V.   Compare and contrast bamboo and timber as a building material.

PART B

(2 × 20 = 40)

VI.   Draw to a suitable scale, plan of odd and even courses, section and elevation of two consecutive courses of 1 brick wall in Flemish bond.
OR
VII.   Draw to a suitable scale, plan of odd and even courses, section and elevation of two consecutive courses of 1 brick wall in English Cross Bond.

VIII.   Draw to a suitable scale, plan, section and elevation of a wooden framed and paneled door to fit an opening of size 120 cm × 210 cm.
Label the parts and their sizes.
OR
IX.   Draw to scale the following:
        (i)   Mortise and Tenon Joint
        (ii)   Angle Halved Joint
        (iii)   Lapped Joint
        (iv)   Tusk Tenon Joint

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AR 1103 HISTORY OF ARCHITECTURE I
(2014 Scheme)

Time : 3 Hours   Maximum Marks : 100

(Illustrate ALL answers with sketches.)

PART A
(Answer *ALL* questions)

(8 × 5 = 40)

I. Write a short note on the following:
- (a) Gobekli Tepe
- (b) Jericho
- (c) Ziggurat
- (d) Roman orders
- (e) Chaitya Hall at Karl.
- (f) Vedic Village
- (g) Miskal Masjid
- (h) St.Mary's church.

PART B

(4 × 15 = 60)

II. Describe in detail the architectural features of the settlement at Catal Huyuk.

OR

III. How was the architectural development of the Jomon Culture different from that of the rest of the world?

IV. Discuss the significance of Greek architecture, and the Greek orders, citing examples from the Acropolis.

OR

V. The Indus Valley civilization was one of the most advanced city planning concepts. Substantiate this statement with relevant examples.

VI. Explain in detail, the significance and development of temple architecture during the Gupta period citing examples.

OR

VII. What were the peculiar features of Dravidian Pallava architecture? Explain.

VIII. Describe the major features of a typical residence in Kerala.

OR

IX. How were the Kerala temple forms different from the temples of the rest of the country? Explain in detail citing examples.

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AR 1105 ARCHITECTURAL GRAPHICS I
(*2014 Scheme*)

(*Candidates will be supplied with one A-2 size handmade drawing sheet.*)

Time : 4 Hours   Maximum Marks : 100

(4 × 25 = 100)

I. Describe Raja Ravi Varma's paintings and his contribution to modern Indian Art with any two relevant examples.

OR

II. Explain cubism and impressionism with supporting sketches.

III. Draw a composition which will have a three dimensional quality with geometrical forms based on fundamentals of visual art such as form, shading, linear quality, balance, harmony etc. Use any colour media to render the sketch.

OR

IV. Sketch the effect of light in two different angles on a composition made using any three textures and five shapes and monochromatic colour scheme.

V. Design a colour poster in connection with SAVE RIVERS Campaign to an approximate size of paper 20 cm × 30 cm.

OR

VI. Sketch a light and shade pencil drawing of a birds eye-view of a junction.

VII. What are the visual elements essential for a great composition?

OR

VIII. Draw an interior space of an office room with appropriate furnitures and human figures. Render it with perspective possibility with light and shade in pencil.

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AR 1106 MATHEMATICS

(2014 Scheme)

Time: 3 Hours   Maximum Marks: 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Solve $(1+y^2)dx = (\tan^{-1} y - x)dy$.

(b) Find a particular integral to $y'' + 4y = e^x + \sin 2x$.

(c) Verify Euler's theorem for $z = x^3 - 3x^2 y + 3xy^2 + y^3$.

(d) Find the Jacobin of the transformation from the Cartesian coordinates to the cylindrical coordinates.

(e) If a random variable X has Poisson distribution such that $P(X=1) = P(X=2)$, find its mean and variance. Also find $P(X=4)$.

(f) Five dice are thrown 243 times. How many times does one expect to get at least two dice to show 1 or 2.

(g) What is meant by statistical estimation? Distinguish between point estimation and interval estimation.

(h) If a random sample of size $n = 20$ from a normal population with variance $\sigma^2 = 2.25$ has mean $\bar{x} = 64.3$, construct a 95% confidence interval for the population mean μ.

PART B

$(4 \times 15 = 60)$

II. (a) Solve $\dfrac{d^2 y}{dx^2} + 2y = x^2 e^{3x} + e^x \cos 2x$.

(b) Solve $\dfrac{d^2 y}{dx^2} - 4\dfrac{dy}{dx} + 4y = \dfrac{e^{2x}}{x}$.

OR

III. (a) Solve $(1+x)^2 y'' + (1+x)y' + y = 2\sin \log(1+x)$.

(b) Solve $\dfrac{dx}{dt} = 5x + y, \quad \dfrac{dy}{dt} = y - 4x$.

IV. (a) If $u = \sin^{-1}\left(\dfrac{x}{y}\right) + \tan^{-1}\left(\dfrac{y}{x}\right)$, show that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = 0$.

(b) Show that of all the rectangular parallelepipeds with given volume, the cube has the least surface area.

OR

V. (a) If $u = f(2x-3y, 3y-4z, 4z-2x)$ prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + z\dfrac{\partial u}{\partial z} = 0$.

(b) Find the percentage error in the area of ellipse if 2% error is made in measuring the major and minor axes.

(P.T.O.)

VI. (a) If X is a normal variable with mean 30 and SD 5, find

$$P[26 \le X \le 40], \quad P[X \ge 45] \text{ and } P(|X-30|>5)$$

(b) In a partially destroyed laboratory records, only lines of regression of y on x and x on y are available as $4x-5y+33=0$, $20x-9y=107$ respectively. Calculate $\bar{x}, \bar{y}$ and the coefficient of correlation between them.

OR

VII. (a) The probability density function of a random variable X is given by

$$f(x) = \begin{cases} \dfrac{k}{4} & \text{for } -2 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

Obtain the value of k, $P[X<1]$, $P[|X|>1]$ and $P[2X+3>5]$.

(b) Fit a parabola of the form $y = a + bx^2$ to the following data

x:	1	2	3	4	5
y:	0.43	0.83	1.4	2.33	3.42

VIII. (a) A soft drink vending machine is set so that the amount of drink dispensed is a random variable with a mean of 200 millilitre and a standard deviation of 15 millilitre. What is the probability that the average amount dispensed in a random sample of size 36 is at least 204 millilitre?

(b) Suppose that 100 tires made by certain manufacturer lasted on the average 21,819 miles with a standard deviation 1295 miles. Test the null hypothesis $\mu = 22,000$ miles against the alternative $\mu < 22,000$ at 0.05 level of significance.

OR

IX. (a) If S_1 and S_2 are the standard deviations of independent random samples of size $n_1 = 61$ and $n_2 = 31$ from normal population with $\sigma_1^2 = 12$ and $\sigma_2^2 = 18$, find $P\left(\dfrac{S_1^2}{S_2^2} > 1.16\right)$.

(b) A team of efficiency experts intends to use the mean of a random sample of size $n = 150$ to estimate the average mechanical aptitude of assembly-line workers in a large industry (as measured by a certain standardized test). If based on experience the efficiency expert can assume that $\sigma = 6.2$ for such data, what can they assert with probability 0.99 about the maximum error of the estimate?

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AR 1107 GEOMETRICAL DRAWING
(2014 Scheme)

(Assume suitable scale/data whenever necessary)

Time : 4 Hours   Maximum Marks : 100

PART A
(Answer ALL questions)

(8 × 5 = 40)

I. (a) Construct a diagonal scale of 1:5000 to show single metre and long enough to
          measure 300 metres. Mark on the scale a distance of 285.5 metres.

   (b) Sketch and show how different conic sections are generated.

   (c) Draw projection of the following points on a common reference line
        (i)   P is 30 mm below H.P and 15 mm behind V.P.
        (ii) Q in H.P and 35 mm behind V.P.
        (iii) R in both H.P and V.P.
        (iv) S is 15 mm below H.P and 35 mm in front of V.P.

   (d) Define the following terms:
        (i)   Projection
        (ii) Station point
        (iii) Plane of projection
        (iv) Projector

   (e) Explain the types of section planes.

   (f) What are the different methods of developments?

   (g) Define the method of construction of an isometric scale.

   (h) Define the following terms:
        (i)   Ground plane
        (ii) Auxillary ground plane
        (iii) Picture plane

PART B
(Retain all construction lines)

(4 × 15 = 60)

II.   Two points F and F' are located on a plane sheet 150 mm apart. A point P
      on the curve moves in such a way that the difference of its distance from F
      and F' always remains a constant and it is equal to 105 mm. Find the locus
      of the point and name the curve. Also mark its asymptotes and directrices.

                                    OR

III. Construct an Archimedian spiral for one convolution. The initial and final
      radius vectors are 30 mm and 120 mm respectively. Draw a normal and
      tangent to the spiral at a point P, 72 mm from the pole.

IV.   A line, AB, 65 mm long has its end A 20 mm above the HP and 25 mm in
      front of VP. The end B is 40 mm above the HP and 65 mm in front of the
      VP. Draw the projections of A and B and measure the lengths of top and
      front views.

                                    OR

V.   Draw the projection of a pentagonal pyramid 40 mm side and axis 70 mm long, if it is resting on one of its base edges with the axis making an angle of 30° with HP and top view of the axis making an angle of 45° with xy-line.

VI.   A vertical cylinder of φ 150 mm and 225 mm long is completely penetrated by a horizontal cylinder φ 126 mm and 210 mm long. The axis of the horizontal cylinder is parallel to VP and is 10 mm in front of the axis of the vertical cylinder. Draw the projections of solids showing lines of intersection.

OR

VII.   A square pyramid of base 20 mm and altitude 40 mm rests on its base on the HP and two sides of the base parallel to the VP. It is cut by a plane bisecting the axis and inclined at 40° to the base. Draw the development of the lateral surfaces of the lower part of the cut pyramid.

VIII. Hexagonal pyramid of side 25 mm and height 60 mm is resting with its axis vertical, on HP with its adjacent sides equally inclined to VP. Draw its isometric view.

OR

IX.   A cube of 25 mm side is placed vertically with one of its edges on the picture plane and the top square end face touching auxiliary ground plane at a height of 45 mm above the horizon plane. The vertical edge formed by the two adjacent rectangular faces which are inclined at 45° to the picture plane, touches the picture plane. Draw the perspective view of the cube if the station point is 70 mm in front of the picture plane and lies in the central plane which is 30 mm to the right side of the centre of the cube.

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AR 1108 MECHANICS OF STRUCTURES
(2014 Scheme)

Time: 3 Hours   Maximum Marks: 100

PART A
(Answer ALL questions)

(8 × 5 = 40)

I. (a) Explain resultant, equilibrium and equilibrant.

(b) Explain angle of friction and angle of repose.

(c) Determine the moment of inertia of a triangle about base.

(d) Explain the method of sections for analysis of trusses.

(e) Draw the shear force and bending moment diagrams of a cantilever beam subjected to uniformly varying load from at free end to w/m at fixed end.

(f) Derive relationship among load intensity, shear force and bending moment.

(g) Derive relationship between modulus of elasticity and modulus of rigidity.
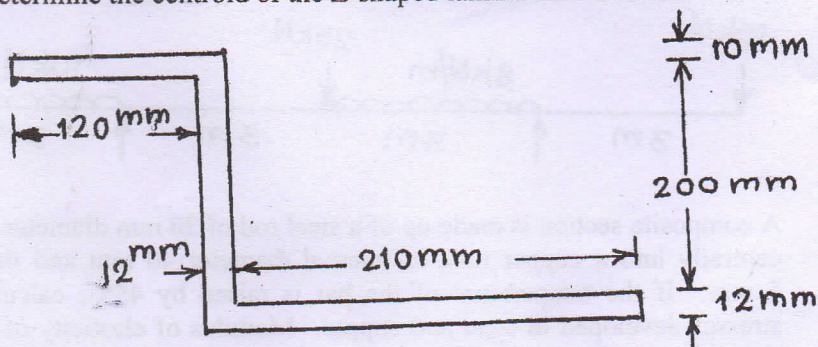
(h) Explain principle of super position.

PART B

(4 × 15 = 60)

II.   Find the magnitude, direction and position of resultant of forces 30, 20, 40 and 50 N that act along the four sides of a square of side 50 mm.
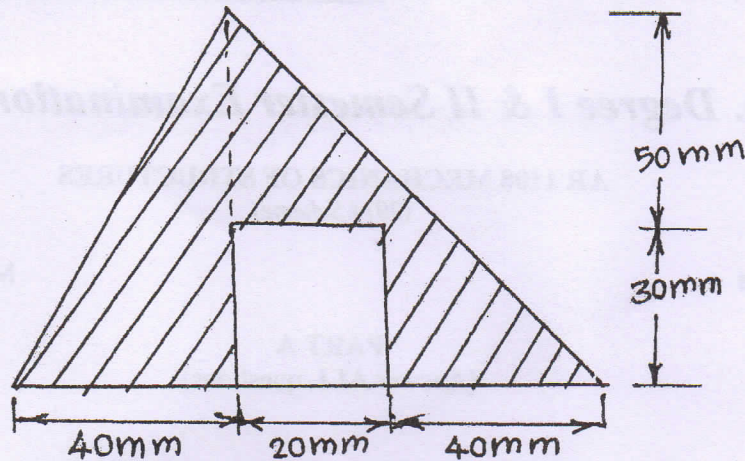
OR

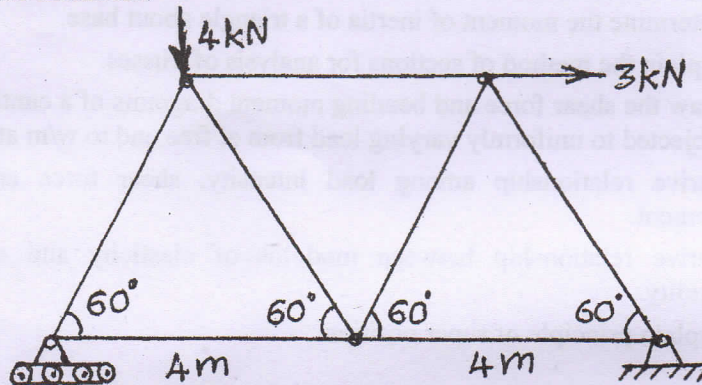III.   Determine the centroid of the Z-shaped lamina shown below.

(P.T.O.)

IV.   Determine moment of inertia about the centroidal XX and YY axes of the shaded area shown in figure.
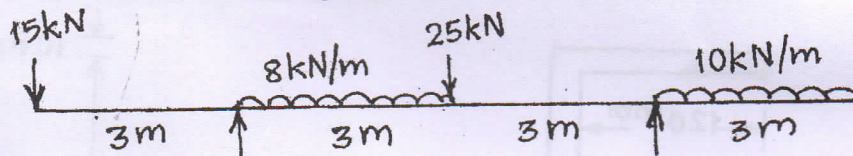

OR

V.   Analyse the truss shown in figure by method of joints and find the forces in all the members.

VI.   Draw the SFD and BMD of a simply supported beam of span 10 m, which carries u.d.l. of 5 kN/m for entire span and a couple moment 24 kNm at 7 m from left end.

OR

VII.   Draw the shear force and bending moment diagrams for the overhanging beam loaded as shown in figure.

VIII.   A composite section is made up of a steel rod of 20 mm diameter located centrally into a copper tube of internal diameter 40 mm and thickness 5 mm. If the temperature of the bar is raised by 45°C, calculate the stresses developed in steel and copper. Modulus of elasticity of steel is 2×10^5 N/mm^2 and of copper is 1×10^5 N/mm^2. Coefficient of thermal expansion of steel is 12×10^{-6}/°C and that of copper is 10×10^{-6}/°C.

OR

IX.   A simply supported beam of span 5 m is of section 150 mm × 250 mm. When concentrated load W is placed at a distance 'a' from left end, the maximum bending stress and shear stress in the beam is 11.2 MPa and 0.8 MPa respectively. Determine the load W and distance 'a'.

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A

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AR 1109 SURVEYING AND LEVELLING
(2014 Scheme)

Time: 3 Hours   Maximum Marks: 100

PART A
(Answer *ALL* questions)

(8 × 5 = 40)

I.   (a)   What are the principles of surveying?
     (b)   Explain with a neat diagram the various parts of theodolite.
     (c)   What is meant by reciprocal leveling?
     (d)   Explain the different obstacles in chaining.
     (e)   List the factors affecting the choice of contour intervals.
     (f)   What are the advantages of Auto-level?
     (g)   Define:
              (i) Bench mark
              (ii) Station in levelling
     (h)   List the fundamental lines in the theodolite.

PART B

(4 × 15 = 60)

II.   Explain the various types of surveying in detail.
                                    OR
III.   Write a note on the Bessel's graphical method for 3 point problem.

IV.   What are the temporary adjustments in theodolite? Explain each.
                                    OR
V.   Write in detail about total station and explain its uses.

VI.   Differentiate between the line of collimation method and rise and fall method.
                                    OR
VII.   The following were the readings taken with a dumpy level. The instrument was shifted after the third, sixth and eighth readings: 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684. Rule out the pages in a field book and enter the readings. Also calculate the RL of each station. Use the line of collimation method. Assume the initial RL as 100 m.

VIII. What are the characteristics and uses of contours?
                                    OR
IX.   Explain with neat sketches the various steps involved in cross sectioning.

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