UNIVERSITY OF KERALA

B. ARCH. DEGREE COURSE

(2013 SCHEME)

MODEL QUESTION PAPERS

FOR

COMBINED I & II SEMESTER

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

MODEL QUESTION- I

13AR1101 ARCHITECTURAL DESIGN

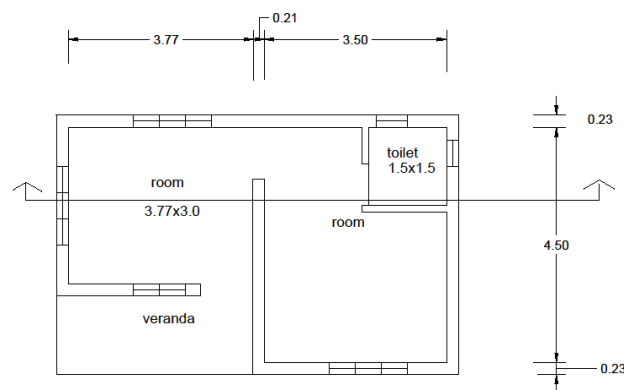Time : 4 Hours   Max Marks: 100

Instruction: To be supplied with one drawing sheet & two butter sheets

*Answer any **one** full Question. Each question carries 100 Marks*

The drawings should be properly dimensioned, labeled in good lettering and rendered appropriately. Importance will be given to drafting quality and correctness of the drawing.

2.   Prepare a neatly drafted technical drawing of the building plan given below.

   a) Min. height of building – 3m; Lintel height - 2.1m; Height of plinth from ground level - 0.45m; Sizes of doors & windows may be assumed.

   b) A suitable elevation may be prepared.

   c) Drawings required:

      1.   Plan with plastering, showing window and door frames. Scale: 1: 20

      2.   Front Elevation   ”

      3.   Section through the section line given   ”
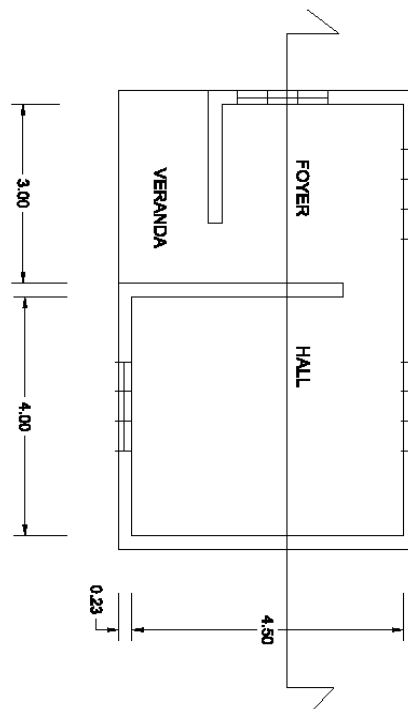

OR

3.   Prepare a neatly drafted detailed technical drawing of the building plan given below:

a) Min. height of building – 3m; Lintel height - 2.1m; Height of plinth from ground level - 0.45m; Sizes of doors & windows may be assumed.

b) A suitable elevation may be prepared.

c) Drawings required:

    1. Plan (with plastering), showing window and door frames. Scale: 1: 20

    2. Side Elevation   "

    3. Section through the section line given   "

Combined First and Second Semester (S1S2) B Arch Degree Examinations

MODEL QUESTION- II

13AR1101 ARCHITECTURAL DESIGN

Time : 4 Hours   Max Marks: 100

Instruction: To be supplied with one drawing sheet & two butter sheets

*Answer any **one** full Question. Each question carries 100 Marks*

The drawings should be properly dimensioned, labeled in good lettering and rendered appropriately. Importance will be given to drafting quality and correctness of the drawing.

1.   Prepare a neatly drafted, detailed technical drawing of the building plan given below:

   b) Min. height of building – 3m; Lintel height - 2.1m; Height of plinth from ground level - 0.45m; Sizes of doors & windows may be assumed.

   b) A suitable elevation may be prepared.

   c) Drawings required:

   4. Plan with plastering and door, window frames   Scale: 1: 20
   5. Front Elevation   ”
   6. Section through the section line given   ”
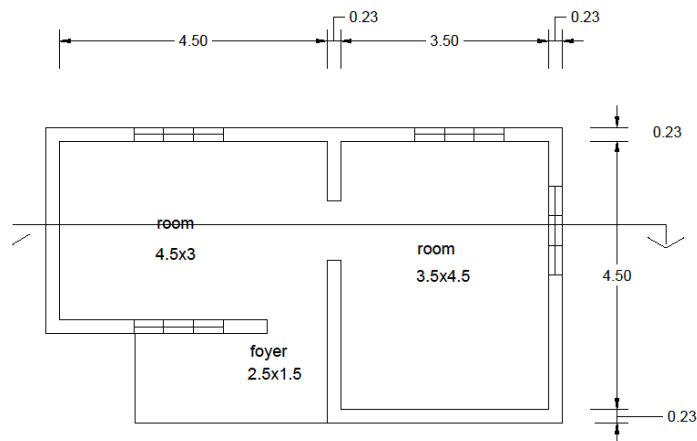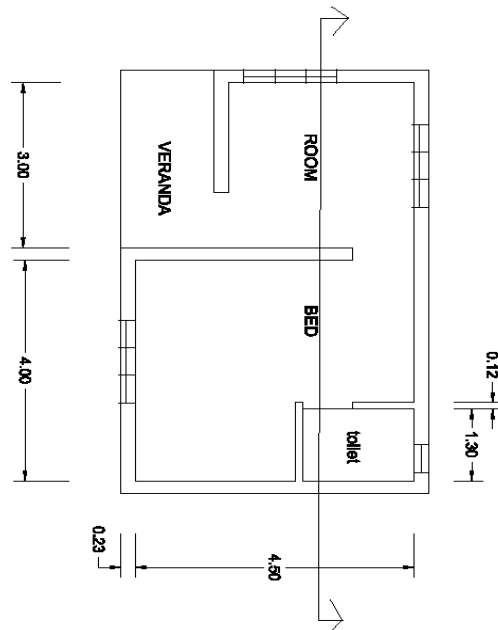
2.   Prepare a neatly drafted technical drawing of the building plan given below:

a)   Min. height of building – 3m; Lintel height - 2.1m; Height of plinth from ground level - 0.45m; Sizes of doors & windows may be assumed.

b) A suitable elevation may be prepared.

c) Drawings required:

     1.   Plan showing plastering, door& window frames   Scale: 1: 20
     2.   Side Elevation   ”
     3.   Section through the section line given   ”

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

MODEL QUESTION- I

13AR1102: BUILDING MATERIALS & CONSTRUCTION I

Time: 4 Hours   Max Marks: 100

*Answer **ALL** questions*

Illustrations in answers carry due marks.

PART A

1) Write short notes on the following.

   a) Classification of rocks.
   b) Terracotta flooring.
   c) Random rubble masonry.
   d) True arches.
   e) Hard wood and soft wood.
   f) Components of a wooden door.
   g) Adobe construction.
   h) Properties of bamboo.   (8 x 5 = 40 marks)

2) a) Explain how cement mortar is prepared. Describe in what proportions mortar is prepared, for various applications in building construction.   (10 marks)

OR

   b) Explain the construction of rat trap bonding. What are the advantages and disadvantages of this type of bonding over English and Flemish bonds? (10 marks)

3) a) Explain the need for seasoning timber. What are the methods for seasoning of timber?   (10 marks)

OR

   b) Explain the method of preparation of mud for construction. What are the natural methods employed for stabilizing mud.   (10 marks)

PART B

4) a) Draw, to a suitable scale, the plan of odd & even course of a one brick thick wall, for a 90° corner of a room constructed in English bond. Draw its elevation also.

OR

   b) Draw, to a suitable scale, the plan of odd & even course of a one brick thick wall, for a 90° corner of a room constructed in Flemish bond. Draw its elevation also

(20 marks)

5) a) Draw, to a suitable scale, the plan, elevation and section of a fully paneled wooden door for an opening of 100 cm X 210 cm.

<div align="center">OR</div>

b) Draw, to a suitable scale, the plan, elevation and section of a fully glazed wooden window for an opening of 100 cm X 150 cm.

<div align="right">(20 marks)</div>

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

MODEL QUESTION- II

13AR1102: BUILDING MATERIALS & CONSTRUCTION I

Time: 4 Hours   Max Marks: 100

*Answer **ALL** questions*

Illustrations in answers carry due marks.

PART A

1) Write short notes on the following.

   a) Commonly available building stones and uses.
   b) Water Cement ratio.
   c) Coursed rubble masonry.
   d) Semicircular arches.
   e) Timber types employed in construction in Kerala.
   f) Joints in timber construction.
   g) Cob construction.
   h) Application of bamboo in construction.

2) a) Explain how cement concrete is prepared. What are the recommended mixes for various applications in building construction?   (10 marks)

   OR

   c) Explain the construction of brick arches. Illustrate a segmental arch.   (10 marks)

3) a) Explain the steps involved in timber construction. What are the defects usually found in timber?   (10 marks)

   OR

   c) Explain the properties of bamboo. Compare and explain the advantages and disadvantages of using bamboo over wood in construction.   (10 marks)

PART B

4) a) Draw, to a suitable scale, the plan of odd & even course of a one brick thick wall, for a 90° corner of a room constructed in Rat trap bond. Draw its elevation also.

   OR

   b) Draw, to a suitable scale, the elevation of a semi circular arch and a segmental arch for an opening of span 150 cm.

   (20 marks)

5) a) Draw, to a suitable scale, the plan, elevation and section of a partially glazed wooden door for an opening of 100 cm x 210 cm.

<div align="center">OR</div>

c) Draw, to a suitable scale, the plan, elevation and section of a wooden flush door for an opening of 100 cm x 150 cm.

<div align="right">(20 marks)</div>

Combined First and Second Semester (S1S2) B. Arch Degree Examination (2013 Scheme)

MODEL QUESTION PAPER I

13AR1103 HISTORY OF ARCHITECTURE

Time : **3 Hours**   Max Marks:100

Use Illustrations wherever required. Illustrations carry due marks.

Part A

(Answer **ALL** Questions)

1. Write short notes on the following.
    a) Pre Historic Jericho

    b) Great bath of Indus Valley

    c) Ishtar Gate

    d) Basilica

    e) Lomas rishi

    f) Design of Dravidian Temple

    g) Toppikkallu

    h) Cave Temples of Kerala   (8 x 5 = 40 marks)

Part B

*(Answer **ONE** full question from **each** module) (4 × 15= 60 marks)*

MODULE I

2.   a) Discuss the general characteristics of Prehistoric human settlements citing one
     example.

OR

b) Discuss the city planning principles of Indus valley civilization

MODULE II

3. a) Describe the evolution of Egyptian Pyramids and explain the component parts of
    the Great Pyramid of Giza.

OR

b) Explain the Architectural characteristics of Greek temples and discuss the
Principles of 'Optical correction' they used in the buildings.

MODULE III

4. a) Describe the evolution of Buddhist architecture and explain with sketches the features of The Great Stupa of Sanchi.

OR

b) Explain the Planning Principle used for Dravidian Temples, its design and technology.

MODULE IV

5. a) Discuss the various factors that influenced the Traditional Architecture of Kerala.

OR

b) Discuss the Roman, Chinese & Jewish influence in Kerala Architecture citing examples from each styles.

Combined First and Second Semester (S1S2) B. Arch Degree Examination (2013 Scheme)

MODEL QUESTION PAPER II

13AR1103 HISTORY OF ARCHITECTURE

Time : **3 Hours**   Max Marks:100

Use Illustrations wherever required. Illustrations carry due marks.

Part A

(Answer **ALL** Questions)

1. Write short notes on the following.
    a) Gobekli Tepe

    b) Great bath of Indus Valley

    c) Great Ziggurat

    d) Agora

    e) Ajantha Caves

    f) Shore Temple, Mahabalipuram

    g) Toppikkallu

    h) Edakkal Cave   (8 x 5 = 40marks)

Part B

*(Answer **ONE** full question from **each** module) (4 × 15= 60 marks)*

MODULE I

2.   a) Discuss the general characteristics of the settlement at Catal Huyuk. How is it important in terms of architectural development through civilizations?

OR

b) Discuss the development of 'Housing' from earliest known periods to later civilizations.

MODULE II

3. a) Describe the Great Pyramid of Giza in detail.

OR

b)"Roman Architecture is more about the development of Structural details than Architecture" Do you agree with this statement? Discuss your answer in detail.

MODULE III

4. a) Describe the different types of structures developed under Buddhist architecture, taking any Buddhist cave dwelling unit as example.

OR

b) Explain the planning principle used for Dravidian Temples, its design and technology.

MODULE IV

5. a) Discuss the various factors that influenced the Traditional Architecture of Kerala.

OR

b) Discuss the earliest known architectural monument typologies of Kerala with examples.

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

MODEL QUESTION- 1

13AR1105   ARCHITECTURAL GRAPHICS - I

Time : 4 Hours   Max Marks: 100

Instruction: To be supplied with one handmade sheet A2 size & one butter sheet

Answer All Questions

PART- I

I. Write short notes on:

1) Paintings of Raja Ravi Varma.

2) Contribution of the Mughals to Indian art.

3) Gian Lorenzo Bernini.

4) Cubism.

5) Warm and cool colours.

6) Chroma of a colour.

7) Fluting of colours.

8) Munsell's colour space.   **(8x5=40 Marks)**

Part II

II.   Design a composition of triangles. Use monochromatic colour medium with emphases on shades and shadows. Balance and emphasis can be explored.

OR

III.   Prepare a water colour drawing of a traffic block at a busy junction which is not provided with traffic signals and where 4 roads meet. The confusion created can be brought out vividly.

(60x1=60 Marks).

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

MODEL QUESTION- II

13AR1105   ARCHITECTURAL GRAPHICS - I

Time : 4 Hours   Max Marks: 100

Instruction: To be supplied with one handmade sheet A2 size & one butter sheet

Answer All Questions

PART- I

I.   Write short notes on

   a)   Mural paintings of Kerala.

   b)   Tanjore Paintings.

   c)   Leon Battista Alberti.

   d)   Impressionism

   e)   Complementary and analogous colours.

   f)   Value of colour.

   g)   Psychological aspect of colour and space.

   h)   Munsell's colour solid.   *(8x5=40 Marks)*

Part II

II. Design a poster of size -25×40 cm to be used in connection with 'World Habitat day`. Use water colour medium with emphases on any principle of the principles of composition.

                                                          OR

II. Draw a secondary and tertiary colour wheel to suitably fit into the sheet provided.

                                                                              (60x1=60 Marks)

Combined First and Second Semester (S1S2) B. Arch Degree Examination (2013 Scheme)

MODEL QUESTION PAPER I

13AR 1106 THEORY OF DESIGN

Time: 3 Hrs.   Max. Marks 100

Illustrate all answers with sketches.
Answers should be brief and to the point.

Part A

(Answer **ALL** Questions)

1. Write descriptive answers on the following.
   a) MODULOR.
   b) Anthropometry.
   c) Personal space.
   d) Visual Perception
   e) Modifying Elements.
   f) Design Brief.
   g) Path –Space relationship.
   h) Voids and Solids.   (8 x 5=40 marks)

Part B

*(Answer **ONE** full question from **each** module) (4 × 15= 60 marks)*

MODULE I

2. a) The primary elements in Architecture are the essence of any architectural expression? Explain with illustrative examples?

OR

b) Geometry is innate in many aspects of **Architecture**? Explain with examples?

MODULE II

3. a)The Ordering Principles in Architecture can be utilized to create order in architectural   composition. Explain with examples?

OR

b) '*ARCHITECTURE* is always carried into effect by means of *SCALE* and *PROPORTION*'. Explain with examples?

MODULE III

4. a) Architects generally used pragmatic, iconic, analogic and canonic methods for generating three dimensional forms? Explain the process with examples?

OR

b) Explain the importance of context in the architectural design process? Give a detailed explanation how the analysis and synthesis of context will help in arriving at unique architectural solutions?

MODULE IV

5. a) The philosophy, spatial expression and innovative technology made Laurie Baker '*The architect of the poor.*" Discuss in detail with examples how Baker translated his philosophy and technology into his architecture?

OR

b) "*FORM FOLLOWS FUNCTION* –that has been misunderstood. FORM and FUNCTION should be one joined in a spiritual union" F.L.WRIGHT. Do you agree with the statement? Give your answer by explaining his woks

Combined First and Second Semester (S1S2) B. Arch Degree Examination (2013 Scheme)

MODEL QUESTION PAPER II

13AR 1106 THEORY OF DESIGN

Time: 3 Hrs.   Max. Marks 100

Illustrate all answers with sketches.
Answers should be brief and to the point.

Part A

(Answer **ALL** Questions)

1. Write descriptive answers on the following.
    i)   Volume.
    j)   Contrast.
    k) Additive form.
    l)   Axis.
    m) Concept.
    n) Site study.
    o) Laurie Baker.
    p) Loius Sullivan.   (8 x 5=40 marks)

Part B

*(Answer **ONE** full question from **each** module) (4 × 15= 60 marks)*

MODULE I

2. a) What are the basic principles of Composition in Architecture.

OR

    b) Explain with examples the different elements that define space

MODULE II

3. a) Explain the Ordering Principles in Architecture. Explain with examples.

OR

    b) Explain the different primary forms and its properties.

MODULE III

4. a) Explain the different processes involved in the methodology of design.

OR

    b) What are the different methods of generating Architectural Design.

MODULE IV

5. a) Describe the life, works and philosophy of the Great Modern architects: Le Corbusier, Mies Vander Rohe, Walter Gropius and F L Wright.

OR

b) Trace the evolution of Modern architecture in India through the works of Architects: B V Doshi, Charles Correa and Achyut Kanvinde with the help of examples.

Combined First and Second Semester (S1 S2) B.Arch Degree Examination (2013 Scheme)

MODEL QUESTION PAPER   - II

13AR1107 GEOMETRICAL DRAWING

Time: 4 Hours   Max. Marks: 100

*Instructions: i) Answer Part **A** in the answer book provided.*
*ii) Answer Part **B** in the drawing sheet provided.*
iii) Assume suitable scale/data wherever necessary.

PART A
(Answer all questions)

1. a) Construct a plain scale to show metres when 1 centimetre represents 4 metres and long enough to measure up to 50 metres. Find the representative fraction (R.F.) and mark on it a distance of 36 metres.

   b) Define the following with respect to conic sections.
        i) Directrix ii) Latus rectum iii) Abscissa iv) Focus v) Vertex

   c) Define trace of a line? How will you locate traces of a line inclined to both HP and VP?

   d) Differentiate between change of position method and auxiliary plane method for drawing projections of solids.

   e) Explain the Gore method of drawing development of a sphere.

   f) Explain the cutting plane method of drawing intersection of surfaces.

   g) What do you mean by isometric scale? Discuss the methods for constructing it.

   h) What do you mean by vanishing point? How will you locate it?

                                                                                      (8x5=40 Marks)

PART B
*(Answer one full question from each module. Each full question carries **15** marks)*
(Retain all construction lines)

Module - 1
2. The foci of an ellipse are 85 mm apart and minor axis is 65 mm. Draw the ellipse by concentric circle method. Draw a tangent and normal at any point on the curve.

OR

3. Sketch the path of a point moving from a point on the periphery of a rim of radius 60 mm, radially inwards upto the centre, in its one revolution. Assume that the vectorial angles and the radius vectors are in arithmetical progression. Name the curve.

Module - II

4. The projections on the XY line of the HT and VT of a straight line AB in the first quadrant are 120 mm apart. The VT is 100 mm above XY and the HT is 50 mm in front of XY. The points A and B are 30 mm and 80 mm above the HP respectively. Draw the projections.

OR

5. A triangular pyramid 50 mm side, axis 70 mm long is freely suspended from one of the corners of its base. Draw the front and top views of the pyramid when the axis of it makes an angle of 60º with the XY line

Module - III

6. A cone of base diameter 60 mm standing upright is cut by a section plane such that the true shape is a parabola of maximum double ordinate 50 mm and vertex of the parabola is 70 mm from this ordinate. Draw front and top views and true shape of the section. What is the inclination of the section plane?

OR

7. A cone of base diameter 100mm and height 130mm rests with its base on HP. It is cut by a section plane inclined at 30º to HP and perpendicular to VP. Draw the development of the truncated cone if the section plane bisects the axis of the cone.

Module - IV

8. A sphere 80 mm diameter is cut horizontally by plane such that 20 mm of its diameter is cut and removed. The remaining part stands centrally on a square plate 30 mm x 30 mm and thickness 15 mm. Draw the isometric projection of combination, if the sphere remains with its flat surface up.

OR

9. Draw the perspective view of a rectangular prism of 100 mm x 50 mm x 40 mm size lying on its 100 mm x 50 mm rectangular face on the ground plane, with a vertical edge touching the picture plane and the end faces inclined at 45º with the picture plane. The station point is 120 mm in front of the picture plane, 80 mm above the ground plane and lies in a central plane which is passing through the centre of the prism.

Combined First and Second Semester (S1 S2) B.Arch Degree Examination (2013 Scheme)

MODEL QUESTION PAPER - I

13AR1107 GEOMETRICAL DRAWING

Time: 4 Hours   Max. Marks: 100

Instructions*: i) Answer Part **A** in the answer book provided.*
*ii) Answer Part **B** in the drawing sheet provided.*
iii) Assume suitable scale/data wherever necessary.

PART A
(Answer all questions)

1. a) What do you mean by helix? Explain the terms pitch and lead of a helix.

    b) Construct a diagonal scale to measure a km such that 10 cm on the drawing sheet represents 250 km. Mark on it a length of 173 km.

    c) A regular pentagonal lamina of 40 mm side has its plane vertical and inclined at 30° to the VP. Draw its projections when one of its sides is perpendicular to HP.

    d) Differentiate between oblique and truncated solids.

    e) Explain various methods of drawing development of surfaces of solids.

    f) Distinguish between true shape and apparent shape of a section.

    g) Distinguish between isometric view and isometric projection of a solid.

    h) Explain different types of perspective projections.

                                                                         (8x5=40 Marks)

PART B
*(Answer one full question from each module. Each full question carries **15** marks)*
(Retain all construction lines)

Module - I

2.   Construct a hyperbola when the distance between the focus and directrix is 40 mm and the eccentricity 4/3. Draw a tangent and normal at any point on the hyperbola.

OR

3.   Draw a logarithmic spiral for one convolution such that angle between consecutive radii is 30°, the successive radii are of the ratio 6:5 and final radius vector is 90 mm. Draw tangent at any point on the curve.

Module - II

4. A line PQ 60 mm long has its end P 30 mm above HP and 15 mm in front of VP. The end Q is 50 mm above HP and 45 mm in front of VP. Draw its projections and find its true inclinations with HP and VP. What are the lengths of front and top views?

OR

5. A pentagonal pyramid, edge of base 25 mm and height 60 mm, is resting on a corner of its base in such a way that the slant edge containing that corner makes an angle of 45º with the HP and 30º with VP. Draw the projections.

Module - II

6. A hexagonal pyramid of base side 25 mm and axis 60 mm rests on its base on HP with two base edges perpendicular to the VP. It is cut by a plane perpendicular to the VP and inclined at 30º to the HP meeting the axis at 35 mm from the base. Draw the elevation, sectional plan and the true shape of the section. What is the maximum true length of the side in the section of the pyramid?

OR

7. The development of the lateral surface of a right circular cone is a semicircle of radius 100 mm. Inscribe a largest possible circle in the semicircle. Draw the front and top views of the cone and locate the inscribed circle in both the views.

Module - IV

8. The frustum of a cone of base diameter 40mm, top face diameter 30mm and length of axis 60mm is resting centrally on the frustum of a hexagonal pyramid base 60mm side, top face 40mm and height 30mm. Draw the isometric projection of the compound solid.

OR

9. Draw the perspective projection of a pentagonal prism of side 25 mm and length 50 mm, lying on one of its rectangular faces on the ground plane and one pentagonal face touching the picture plane. The station point is 55 mm in front of the picture plane and lies in the central plane which is 75 mm to the left of the centre of the prism. Station point is 30 mm above the ground plane.

COMBINED FIRST AND SECOND SEMESTER B.ARCH DEGREE EXAMINATION (2013 scheme)

MODEL QUESTION PAPER I

13AR1108 STRUCTURAL DESIGN - 1

Time: 3 Hours   Max. marks :100

PART A

Answer **ALL** Questions (8 x 5= 40 marks)

1) State and explain the laws of static friction.
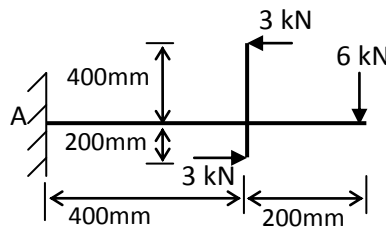2) Determine a single force and its distance from A which is equivalent to the system of forces shown in Fig. 1 below.

Fig. 1

3) Define principal axes and principal moments of inertia of a section.
4) Discuss the assumptions made in the analysis of a truss.
5) Derive the relationship between shear force and bending moment at a section.
6) Write notes on :
   i)   Different types of beams ii) Loads on a beam
7) Derive the relationship between modulus of elasticity and shear modulus.
8) Discuss the stress-strain relationship of mild steel.

PART B

*(Answer **ONE** full question from **each** module)* (4 × 15= 60 marks)

Module I

9) Determine the magnitude of the unknown force P required to keep the rectangular plate ABCD shown in Fig. 2 in equilibrium.

Fig. 2

23
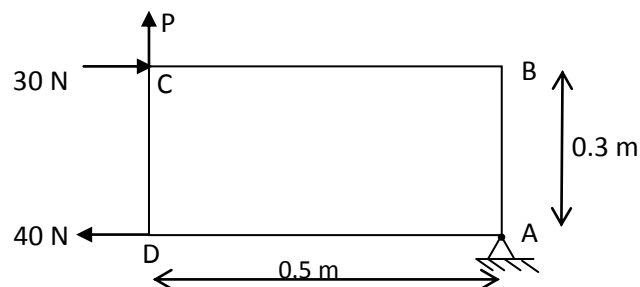
10) Two balls of equal diameter each weighing 100 N, rest on a smooth trough as shown in Fig. 3. Determine the reaction offered by the trough on the lower ball at R.
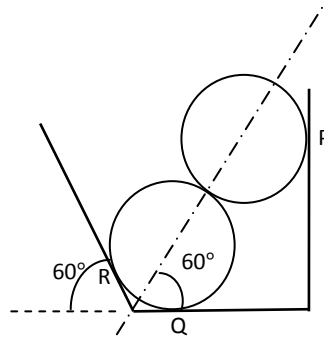

Fig. 3

Module II

11) Determine the moment of inertia about the centroidal axes for the area shown in Fig. 4. (All dimensions in mm). Web is 10 mm thick and flanges are 15 mm thick.
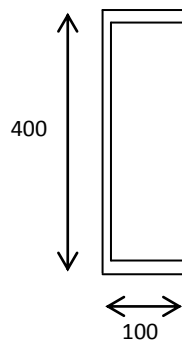

Fig. 4

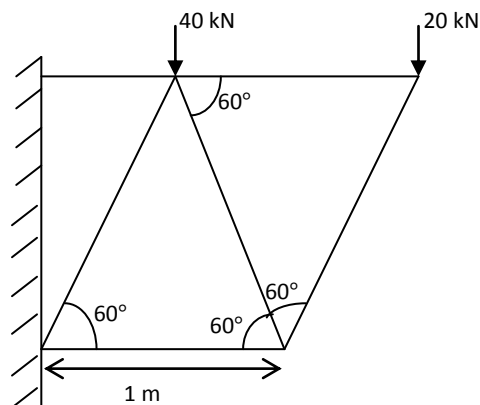12) Determine the forces in the members of the truss shown in Fig. 5.

Fig. 5

Module III

13) Draw the shear force and bending moment diagram for the beam shown in Fig. 6.
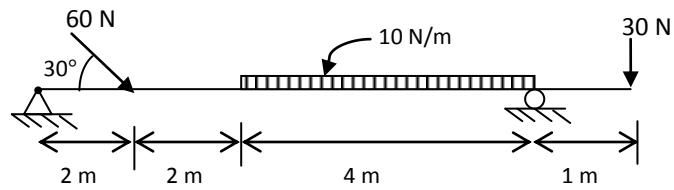
Fig. 6

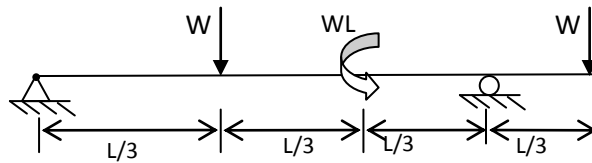14) Draw the shear force and bending moment diagram for the beam shown in Fig. 7.

Fig. 7

Module IV

15) A steel tube 100 mm internal diameter and 125mm external diameter is surrounded by a brass tube of the same length such that their axes coincide. If the outer brass tube has an inner diameter of 126 mm and an outer diameter of 150 mm and the compound tube is loaded by an axial compressive load of 5 kN, find the load carried by each tube and the stresses and strains developed in each tube. Assume E_s= 200 GPa and E_b= 100 GPa.

16) A simply supported beam of 8 m span has cross section in the shape of T as shown in Fig. 8. If it is subjected to a uniformly distributed load of 10 kN/m over its entire length, determine the maximum bending stress.
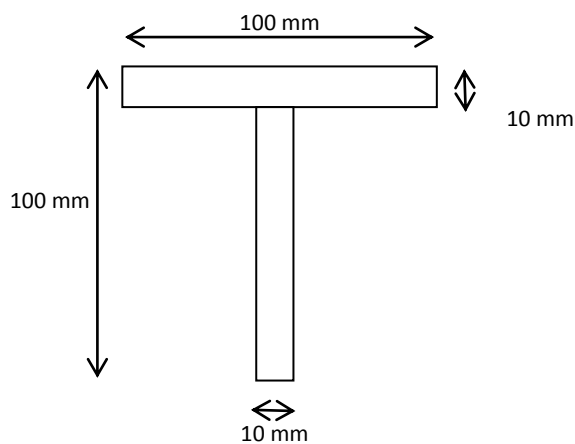

Fig. 8

COMBINED FIRST AND SECOND SEMESTER B.ARCH DEGREE EXAMINATION (2013 scheme)

MODEL QUESTION PAPER II

13AR1108 STRUCTURAL DESIGN - 1

Time: 3 Hours   Max. marks :100

PART A
Answer **ALL** Questions (8x5=40 marks)

1) State and prove Varignon's theorem.
2) Find the angle of repose for a body resting on an inclined plane having coefficient of friction as μ.
3) State and prove the parallel axis theorem.
4) What are the different types of trusses?
5) Write notes on :
    i)   Different types of beams   ii) Loads on a beam
6) Determine the support reactions for the simply supported beam of 5 m span shown in Fig. 1.

Fig. 1
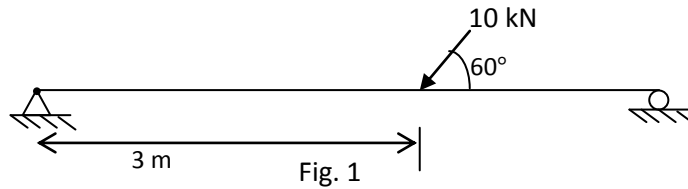
7) State the assumptions made in the theory of simple bending of beams.
8) Determine the shear stress distribution at the support section of a simply supported beam of span L and rectangular cross-section b × d, subjected to a UDL of intensity **w** throughout the span.

PART B

*(Answer **ONE** full question from **each** module) (4 × 15= 60 marks)*

MODULE 1

9) Find the magnitude and direction of the force P if the resultant of four coplanar concurrent forces shown in Fig. 2 is 520 N along the positive direction of Y axis.


Fig. 2
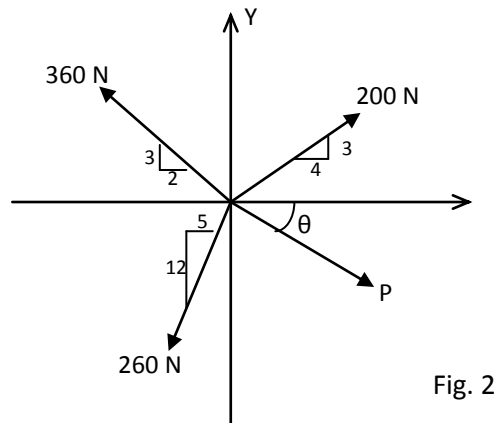
10) Two ladders AB, weighing 900 N and AC, weighing 600 N, each of length 2L are hinged at A and stand with their lower ends B and C resting on a smooth floor. They are prevented from slipping by means of a rope attached to their midpoints. Determine the tension in the rope and the reaction at the hinge.

Module II

11) Determine the moment of inertia about the centroidal axes for the area shown in Fig. 3. (All dimensions in mm).
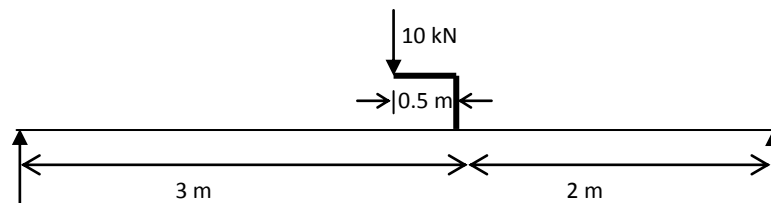

Fig. 3
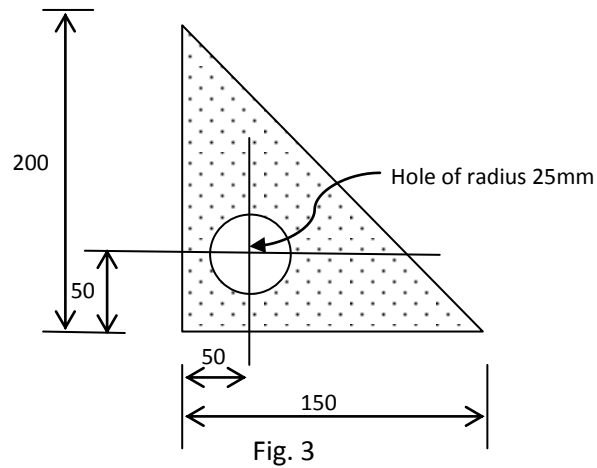
12) Analyse the truss shown in Fig. 4 and determine the member forces.

Fig. 4
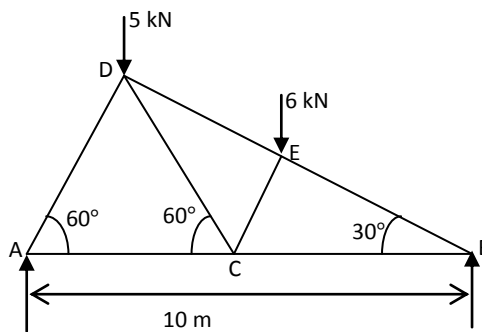
Module III

13) Draw the shear force and bending moment diagram for the beam shown in Fig. 5.

Fig. 5

14) Draw the shear force and bending moment diagram for the overhanging beam shown in Fig. 6.
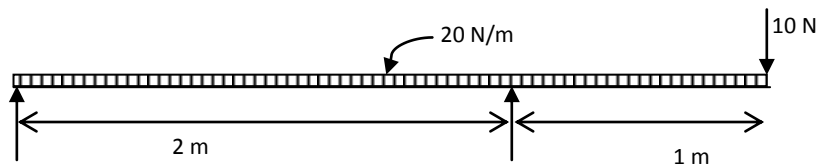
Fig. 6

Module IV

15) A steel tube 2.4 cm external diameter and 1.8 cm internal diameter encloses a copper rod 1.5 cm diameter to which it is rigidly connected at both ends. If at a temperature of 10°C there is no longitudinal stress, calculate the stresses in the rod in the rod and the tube when the temperature is raised to 200°C. E_s= 2.1X10^5 N/mm^2, and E_c= 1X10^5 N/mm^2. α_s= 11X10^{-6} /°C and α_c= 18X10^{-6} /°C.

16) A simply supported beam of 8 m span has cross section in the shape of T as shown in Fig. 7. If it is subjected to a uniformly distributed load of 10 kN/m over its entire length, plot the shear stress distribution at the support section.

Fig. 7

COMBINED FIRST AND SECOND SEMESTER B.ARCH DEGREE EXAMINATION (2013 scheme)

MODEL QUESTION PAPER III

13AR1108 STRUCTURAL DESIGN - 1

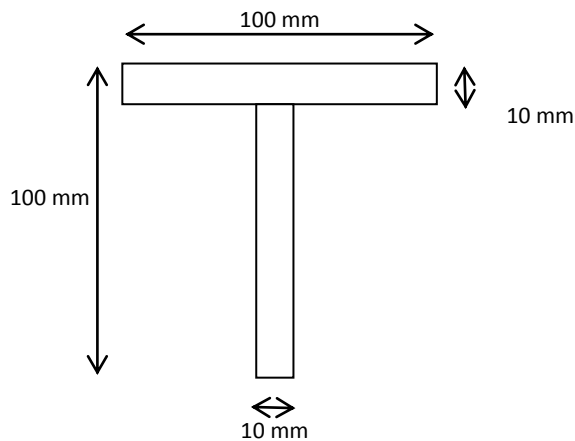Time: 3 Hours   Max. marks :100

PART A

Answer **ALL** Questions (8 x 5= 40 marks)

1. Illustrate with figures the different force systems.
2. Locate the centre of gravity of a triangular lamina.
3. State parallel axes theorem and perpendicular axes theorem.
4. Differentiate between method of joints and method of sections in the analysis of trusses.
5. List out with sketches the types of beams and types of loading.
6. Draw the SFD and BMD of a cantilever beam carrying UDL of w N/m over the whole span.
7. Define the Elastic Constants
8. Give equations to compute bending stress and shear stress and explain the terms.

8×5 = 40 Marks

PART B

*(Answer **ONE** full question from **each** module)* (4 × 15= 60 marks)

Module I

9. (a)Define (i)Limiting force of friction(ii)Coefficient of friction
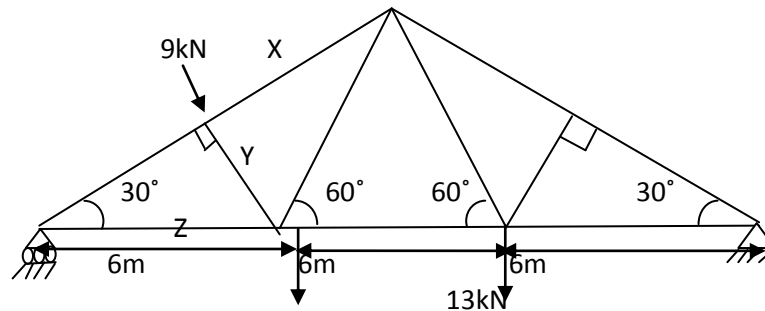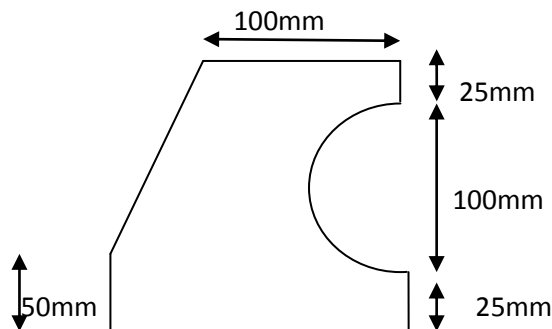   (b)Draw the free body diagram of the truss to determine the support reactions.

FIG.1

OR

10. Locate the centroid of the plane area shown in FIG.2

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Module 2

11. Analyse the forces in the members X,Y,Z of the truss shown in FIG.1

OR

12. Solve I_{xx} and I_{yy} for the area shown in FIG.3
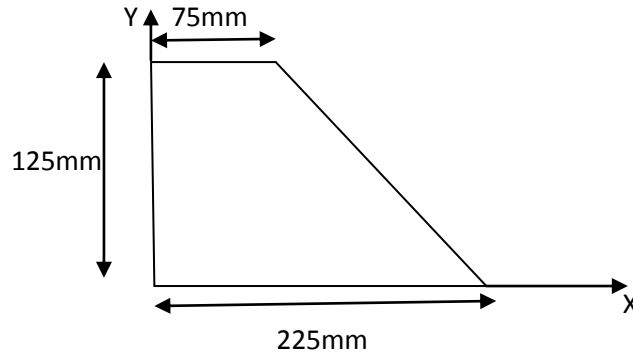
Module III

13. (i)Draw the SFD and BMD of a cantilever carrying UDL for half of its span from the free end.

    (ii) Explain the graphical method for drawing SFD and BMD

OR

14. Draw the SFD and BMD for an overhanging beam of span 5m and an overhang of 2m to the right carrying a udl of 2kN/m over the span and a concentrated load of 2kNat the free end.

Module IV

15. A bar 0.3m long is 50mm square in section for 120mm of its length,25mm diameter for 80mm and of 40mm diameter for the remaining length. If a tensile force of 100kN is applied to the bar, calculate the maximum and minimum stresses produced in it, and the total elongation. Take E= 200GN/m^2

OR

16. A beam having the cross section of an isosceles triangle has horizontal base width 150 mm and height 450 mm. It is subjected to a shear force of 60 kN at a section. Find the horizontal shear stress at the neutral axis and the position and intensity of maximum shear stress. Also compute the bending stresses developed across the cross section.

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

Model Question Paper I

13AR1109 MATHEMATICS

Time :3hrs   Max.Marks :100

PART A

(Answer all questions) (8X5 =40 marks)

(1)   Find the rank of $\begin{bmatrix} 3 & 1 & 2 & 0 \\ 1 & 0 & -1 & 0 \\ 2 & 1 & 3 & 0 \end{bmatrix}$

(2)   If λ =1 is an eigen value of $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$ find the other eigen values?

(3)   If   u= $e^{x^3+y^3}$ prove that $x\frac{\partial u}{\partial x}$+$y\frac{\partial u}{\partial y} = 3u\log u$.

(4)   Find the equation of circle of curvature at(1,1) on the curve x^3 + y^3=2.

(5)   A line makes angles 45^0 and 60^0 with the positive axes of X and Y respectively. What

angles does it makes with the positive Z axis.

(6)   Find the angle between $\frac{x}{1} = \frac{y}{0} = \frac{z}{-1}$ and $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$

(7)   Out of 800 families of 5 children each, how many would you expect to have (i) 3 boys and

(ii) 5 girls?

(8)   A discrete random variable X has the following probability distribution

X	0	1	2	3	4	5	6	7	8
f(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

Find a, P(X<3) and variance.

Part B

(Answer one full question from each module. Each full question carries 15 marks)

Module I

(9)   (a) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

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(b) If A = $\begin{bmatrix} 2 & 4 \\ 1 & 1 \end{bmatrix}$ find A^{-1} and A^3 using Cayley Hamilton theorem

OR

(10) (a) Test the consistency and hence solve 2x-3y+7z = 5,3x+y-3z =13,2x+19y-47z = 32

(b) Show that the vectors (1,1,1), (1,2,3), (2,3,8) are linearly independent.

Module II

(11) (a) Find the curvature of circle $\sqrt{x} + \sqrt{y} = 1$ at the point (1/4, 1/4).

(b)If u= $\sin^{-1}(\frac{x}{y})$ + $\tan^{-1}(\frac{y}{x})$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$.

OR

(12) (a) Find the possible relative error in computing the parallel resistance 'r' of three resistances r_1, r_2, r_3 using the formula $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$, if each of these resistances r_1, r_2, r_3 may be in relative error by 0.012.

(b) If u= $cos^{-1}\frac{x+y}{\sqrt{x}+\sqrt{y}}$ Prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{-1}{2}cotu$

Module III

(13) (a) Prove that the lines $\frac{x+1}{1} = \frac{y+1}{2} = \frac{z+1}{3}$ and x+2y +3z=0=2x+3y+4z-11 are coplanar.

(b) Find the angle between the lines whose direction cosines are given by l+m+n= 0 and $l^2+m^2-n^2 = 0$.

OR

(14) Find the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$.

Also find the equation of the line of shortest distance.

Module IV

(15) (a) Assuming that 20% of the population of a city are literate and also assuming 200 investigators each take 10 persons to see whether they are literate or not .How many investigators would you expect to report 4 persons or less were literate in their group?

(b) Obtain the mean and variance of the binomial distribution.

OR

(16) (a) If the probability that an individual suffers a bad reaction from a certain injection is 0.002, determine the probability that out of 1000 individuals (a) exactly 3 (b) more than 2 will suffer a bad reaction.

(b) If X is a Poisson variate such that P(X=2) = 9 P(X=4) +90 P(x=6), find the standard deviation.

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

Model Question Paper II

13AR1109 MATHEMATICS

Time :3hrs   Max.Marks :100

PART A

(Answer all questions) (8X5 =40 marks)

(1) If A=$\begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$, find the eigen values of A^3

(2) Find the values of k such that the equations x+ky+3z=0 , 4x+3y+kz=0, 2x+y+2z=0 has nontrivial solution

(3) Find the first and second order derivatives of $u = x^2 sin\frac{y}{x}$

(4) If u=$\frac{x}{y} + \frac{y}{z} + \frac{z}{x}$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$

(5) Find the coordinates of the foot of the perpendicular from P (5, 9, 3) in the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$

(6) Prove by direction cosines the points (1,2,3) .(4,0,4),(-2,4,2) are collinear.

(7) Is the function, $f(x) = \frac{1}{18}(3 + 2x), 2 \leq x \leq 4$ a pdf?

   Also find the P ($2\leq x \leq 3$)

(8) Find c for which f(x) =cxe^{-x} ,o<x<∞ is a pdf.

Part B

(Answer one full question from each module. Each full question carries 15 marks)

Module I

(9) (a) For what values of λ and μ the following system of equations 2x+3y+5z =9, 7x+3y-2z=8, 2x+3y+ λz= μ will have (i) unique solution (ii) no solution

   (b) Using Cayley Hamilton theorem find A^{-1} and A^4 if A =$\begin{bmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{bmatrix}$

OR

(10) Find the Eigen values and Eigen vectors of A =$\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

33

Module II

(11) (a) Find the coordinates of the centre of curvature $(\bar{x}, \bar{y})$ of x = 3t, y = t^2 -6 .

(b) Prove that the radius of curvature at any point of the cycloid x= a(θ + sinθ) and

y = a(1-cosθ) is $4a\cos\left(\dfrac{\theta}{2}\right)$.

OR

(12) (a) If u= log($\dfrac{x^4+ y^4 +z^4}{x^2 +y^2+z^2}$) , prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + z\dfrac{\partial u}{\partial z} = 2.$

(b) In calculating the volume and surface area of a right circular cylinder, errors of 0.01cm is made in the measurement. If radius and the height are measured 2cm and 5cm, find the possible error in the volume and surface area.

Module III

(13) (a) Find the equation of the line through (1, 2, 3) and parallel to the lines whose equations are x-y+2z =5 ; 3x+y+z =6

(b) Prove that the lines $\dfrac{x-4}{2} = \dfrac{y-5}{3} = \dfrac{z-6}{4}$ and $\dfrac{x-2}{3} = \dfrac{y-3}{4} = \dfrac{z-4}{5}$ are coplanar.

OR

(14) Find the shortest distance between the lines $\dfrac{x-3}{3} = \dfrac{y-8}{-1} = \dfrac{z-3}{1}$ and $\dfrac{x+3}{-3} = \dfrac{y+7}{2} = \dfrac{z-6}{4}.$

Also find the equation of the line of shortest distance.

Module IV

(15) (a) Three volume of one work, four volume of another and two volume of a third are arranged in a row at random in a shelf. Show that the probability that the volumes of each work are together is $\dfrac{1}{210}$

(b) Obtain the mean and variance of the binomial distribution

OR

(16) (a) Find the mean and variance of Poisson distribution

(b) If average rain falls on 10 days in every 30 days, obtain the probability that rain will fall at least 3 days of a given week.

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

MODEL QUESTION- III

13AR1109 MATHEMATICS

3 Hours   Max. Marks 100

Part A

Answer **all** Question .Each question carries 5 marks.

1. Find the area of the triangle whose vertices are (-2 , 4), (2 , -6) and (5 , 4).

2. Find the rank of the matrix $\begin{bmatrix} 2 & -2 \\ -1 & 1 \\ 3 & -3 \end{bmatrix}$

3. Find the radius of curvature at $(\frac{1}{4}, \frac{1}{4})$ on the curve $\sqrt{x} + \sqrt{y} = 1$

4. Verify Euler's theorem for $ax^2 + 2hxy + by^2$.

5. Are the vectors (1, 3, 4, 2), (3, -5, 2, 2) and (2, -1, 3, 2) linearly dependent?

6. Show that the lines $\frac{x+3}{2} = \frac{y+5}{3} = \frac{z-7}{-3}$; $\frac{x+1}{4} = \frac{y+1}{5} = \frac{z+1}{-1}$ are coplanar and find the equation of the plane containing them.

7. From a set of tickets numbered 1 to 100, three are drawn at random. What is the probability that all are odd numbers?

8. Find the binomial distribution with mean = 5 and variance = $\frac{5}{4}$.

(8×5 =40)

Part B

*(Answer **ONE** full question from **each** module. Each full question carries 15 marks.)*

Module I

9. (a) Find the Eigen values and eigen vectors of A = $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

(b) If A= $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$. Find A^2 using Cayley Hamilton theorem.

OR

10. (a) Solve the system of equations

X + Y + Z = 6,   X + 2Y + 3Z = 10 ,   X+ 2Y +5Z =14.

(b) Find the inverse of the Matrix by Gauss-Jordan method $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

Module II

11. (a) Find the equation to the circle of curvature of $y^2 = 12x$ at (3, 6).

(b) If $u = \sin^{-1}(\frac{x}{y}) + \tan^{-1}(\frac{y}{x})$,prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial x} = 0$.

(c) If $u = \tan^{-1}(\frac{x^3+y^3}{x-y})$; $x \neq y$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial x} = \sin 2u$

OR

12. (a) Find the equation of the circle of curvature at (1 ,1)on $x^3 + y^3 = 2.$

(b) If $u = \frac{x}{y} + \frac{y}{z} + \frac{z}{x}$,   Show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$

Module III

13. (a) A line makes angles α, β , γ , δ with the four diagonals of a cube. Prove that

$$\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta. = \frac{4}{3}.$$

(b) Find the angle between the lines whose direction cosines are given by the equations

$$l + m + n = 0 \quad \text{and} \quad l^2 + m^2 - n^2 = 0.$$

OR

14. Find the shortest distance and the equation of the line of shortest distance between the lines $\frac{x-3}{-3} = \frac{y-8}{1} = \frac{z-3}{-1}$ and $\frac{x+3}{3} = \frac{y+7}{-2} = \frac{z-6}{-4}$

Module IV

15. (a) A husband and wife appear for an interview for two vacancies in the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that

(i) both of them will be selected

(ii) only one of them will be selected

(iii) none of them will be selected.

(b) For two events A and B, let P(A) =0.4, P(B) = p and P(AUB) =0.6

      (i) Find p so that A and B independent events.

      (ii) For what values of p, events A and B are mutually exclusive.

OR

16. (a) A car –hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a poison distribution with mean 1.5. Calculate the proportion of days on which a car is neither used and the proportion of days on which some demand is refused. $(e^{-1.5} = 0.2231)$

(b) Fit a Poisson distribution to the following:

X	0	1	2	3	4
f(x)	192	100	24	3	1

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

Model Question Paper IV

13AR1109 MATHEMATICS

Time :3hrs   Max.Marks :100

PART-A
*(Answer **all** questions. **Each** question carries **5** marks)*

1) Show that the vectors $(2,-2,1)$; $(1,4,-1)$ and $(4,6,-3)$ are linearly independent.

2) If λ is an eigen value of an orthogonal matrix, show that $\frac{1}{\lambda}$ is also its eigen value.

3) Find the radius of curvature at any point of the cycloid $x = a(\theta + sin\theta), y = a(1 - cos\theta)$.

4) Find the coordinates of the foot of the perpendicular from $P(5,9,3)$ in the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$

5) If $U = \log\left(\frac{x^3+y^3}{x+y}\right)$ show that $xU_x + yU_y = 2$.

6) A problem in mechanics is given to three students A, B, C whose chance of solving it are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ respectively. If all the three try at the same time, what is the probability that the problem will be solved?

7) A line makes angles 45^0 and 60^0 with the positive axis of x and y respectively. What angles does it make with the positive z axis?

8) If 3% of electric bulbs manufactured by a company are defective, Find the percentage that in a sample of 100 bulbs, there are 5 defectives.

PART – B
*(Answer **one full** question from **each** module. Each Full question carries **15** marks.)*

Module – I

9) (a) Test for consistency and solve
$x + 2y + z = 3$; $2x + 3y + 2z = 5$; $3x - 5y + 5z = 2$; $3x + 9y - z = 4$

(b) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

OR

10) (a) Verify Cayley-Hamilton Theorem for the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

(b) Find the values of k such that the equations x + ky +3z = 0,4x + 3y + kz = 0, 2x + y + 2z = 0 has non-trivial solution.

Module – II

11) (a) Show that the circle of curvature of the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at $(a/4, a/4)$ is

$$\left(x - \frac{3a}{4}\right)^2 + \left(y + \frac{3a}{4}\right)^2 = \frac{a^2}{2}$$

   (b)   If $U = \log(x^3 + y^3 + z^3 - 3xyz)$, prove that $U_X + U_Y + U_Z = \frac{3}{X+Y+Z}$.

OR

12) (a)   If $= \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$

   (b) The torsional rigidity of a length of wire is obtained from the formula $N = \frac{8\pi IL}{t^2 r^4}$.

   If L is decreased by 2%, r is increased by 2%, t is increased by 1.5%, find the corresponding percentage error in N

Module - III

13) (a) Find the equation of the line through $(1, 2, 3)$ and parallel to the line whose equations are $x - y + 2z = 5$; $3x + y + z = 6$

   (b) Prove by direction cosines the points (1,2,3), (4,0,4) and(-2,4,2) are collinear.

OR

14) (a) Show that the lines $\frac{x-4}{2} = \frac{y-5}{3} = \frac{z-6}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ are coplanar.

   (b) Find the shortest distance between the lines

$$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1} \quad and \quad \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$$

Module – IV

15) (a) A class consists of 80 students, 25 of them are girls and 55 boys , 10 of them are rich and remaining poor, 20 of them are fair complexioned. What is the probability of selecting a fair complexioned rich girl?

   (b) Find the mean and variance of the binomial distribution.

OR

16) (a) A car hire firm has two cars which it hires out day by day. The number of demands for a car on each is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days (i) on which there is no demand (ii) on which demand is refused.

   (b) A Random variable X follows Poisson distribution such that $P[X=0] = \frac{2}{3}P[X=1]$, find $P[X=3]$.

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

Model Question Paper I

13AR1110 SURVEYING AND LEVELLING

Time: 3 Hrs   Marks: 100

Answer **all** questions from part A and **one full question from each module** in Part B

Part A

I   a) Explain the terms i) Check lines and tie lines ii) Offsets

   b) What are the advantages and disadvantages of Plane Table Survey?

   c) Explain the temporary adjustments of a Theodolite.

   d) Explain Bowditch's method of balancing the traverse

   e) What is the advantage of a digital level?

   f) What is a distomat? How does it work?

   g) Distinguish between (i) Back Sight and Foresight ii) Longitudinal Sectioning and
      Cross sectioning

   h) What is a contour? What are its uses?   (8x5=40)

Part B

Module I

II   (a) Explain the methods of chaining on sloping ground.   (10)

     (b) With sketch explain a field book used in chain surveying.   (5)

OR

III (a) Explain the method of solution of a three point problem by plane table survey.   (10)

     (b) List the equipments used in Plane Table survey and its uses.   (5)

Module II

IV (a) Explain the method of measuring a horizontal angle by reiteration method using a
        theodolite.   (10)

    (b) Sketch a theodolite and mark its parts.   (5)

OR

V   (a) What is traversing? Explain the process of theodolite traversing.   (10)

    (b) How can the magnetic bearing be measured using a theodolite?   (5)

Module III

VI (a) What is the working principle of a GPS?   (8)

  (b) What is a total station? What is its advantage?   (7)

OR

VII (a) Explain the components of GPS.   (10)

  (b) What is an aerial Photograph? How is it taken?   (5)

Module IV

VIII   The following staff readings were observed with a level. The level was shifted after the 4th, 6th and 9th readings.

  2.215, 3.920, 1.125, 3.420, 2.810, 0.635, 2.910, 1.265, 0.710, 1.215 and 3.820.

  The reduced level of the first point was 525.500. Enter the readings in a level book form and reduce the levels. Find the difference in level between the first and last points.   (15)

OR

IX   (a) What is reciprocal levelling? How is it carried out?   (7)

  (b) What are the characteristics of contours?   (8)

Combined First and Second Semester (S1S2) B Arch Degree Examinations (2013 Scheme)

Model Question Paper II

13AR1110 SURVEYING AND LEVELLING

Time: 3 Hrs   Marks: 100

Answer **all** questions from part A and **one full question from each module** in Part B

Part A

I   a) What is the principle of surveying?

    b) How is orientation done in Plane Table Survey?

    c) What are the permanent adjustments of a Theodolite?

    d) What is closing error? How is it determined?

    e) What is the advantage of providing overlap in aerial photography?

    f) How does an Auto level work?

    g) What are the sources of errors in levelling?

    h) What are the factors affecting selection of contour interval?   (8x5=40)

Part B

Module I

II   (a) What are the sources of errors in chaining? How can it be eliminated?   (10)

     (b) Explain the method of indirect ranging.   (5)

OR

III (a) Explain the method of solution of a two point problem by plane table survey.   (10)

     (b) When is plane table survey suitable?   (5)

Module II

IV (a) Explain the method of measuring a horizontal angle by repetition method using a theodolite.   (10)

    (b) What are the temporary adjustments of a theodolite?   (5)

OR

V (a) How will you find the vertical angle using a theodolite? Explain with a sketch of a field book.   (10)

    (b) What is face right and face left observation?   (5)

Module III

VI (a) What is the working principle of a Total station? How is the data transferred? (10)

(b) What is the use of a distomat? (5)

OR

VII (a) What are the applications of GPS? (10)

(b) How is map prepared from aerial photography? (5)

Module IV

VIII The following consecutive readings were observed with a level and 4 m levelling staff on a continuously sloping ground at a common interval of 20m.

0.385, 1.030, 1.925, 2.825, 0.625, 2.000, 3.110

The reduced level of the first point was 200.000. Enter the readings in a level book form and reduce the levels. Find the difference in level and gradient between the first and last points. (15)

OR

IX (a) What is balancing of back sight and foresight? Why is it required? (7)

(b) What are the uses of contours? (8)