

MARKING SCHEME & SOLUTION KEY (उत्तर कुंजी)

MODEL QUESTION PAPER (2026-2027) - CLASS X

SUBJECT: CONSTRUCTION (NSQF)

CODE: A

MAX MARKS: 60

GENERAL INSTRUCTIONS FOR EVALUATORS / मूल्यांककों के लिए दिशानिर्देश:

- **Stepwise Marking:** Award marks step-by-step according to the division indicated in the scheme.
- **Equivalent Answers:** Full credit should be given for alternative, technically correct terminology or explanations expressed in candidate's own words.
- **Diagrams:** Neat sketches where relevant should be given due weightage even if not explicitly demanded.

SECTION - A: LONG ANSWER TYPE QUESTIONS (15 MARKS)

Q1. Classification of Rubble Masonry (Coursed, Uncoursed, and Random)

5 MARKS

Answer Summary / मुख्य बिंदु:

Rubble Masonry: Stone masonry built using undressed or roughly dressed stones with wide mortar joints.

- **1. Coursed Rubble Masonry:** Stones are laid in horizontal courses of uniform height throughout. Stone blocks are roughly squared. Height of course varies from 50 mm to 200 mm. Used in public buildings, piers, and abutments.
- **2. Uncoursed Rubble Masonry:** Stones are laid without breaking them into regular courses. Stones are directly used from quarry after removing sharp corners. Quoins are dressed. Used for low-cost boundary walls and temporary works.
- **3. Random Rubble Masonry:** Stones of irregular shapes and sizes are fitted together closely. Joints run in all directions. Requires skillful workmanship for proper interlocking. Used for aesthetic appearance in residential and rustic structures.

OR

Q1 (OR). Types of Joints in Stone Masonry

5 MARKS

Answer Summary / मुख्य बिंदु:

- **1. Butt Joint (Plain Joint):** Square edges of two stones are placed adjacent to each other. Simplest type, commonly used.
- **2. Rebated (Lapped) Joint:** Recess (lap) is cut in both stones to overlap, preventing movement and water ingress. Used in copings.
- **3. Tabled Joint:** A tongue (projection) in one stone fits into a matching groove in another. Resists lateral forces/thrusts (used in sea walls/dams).
- **4. Plugged Joint:** Dovetail-shaped sinkings are cut on adjacent edges and poured with molten lead, zinc, or cement grout to bind them.
- **5. Cramped Joint:** Stones are bound using metal cramps (copper, iron) fitted into channels cut on stone top surfaces. Ensures high stability.

Q2. Procedure of Laying Bricks Below and Above Plinth Level

5 MARKS

Answer Summary / मुख्य बिंदु:

Below Plinth Level (Foundation):

- 1. Excavate trench, compact bed, and lay Lean Cement Concrete (PCC) base.
- 2. Mark wall centerlines accurately using string lines and masonry square.
- 3. Lay stepped brick footings using rich mortar (1:4 or 1:6) to distribute load safely.
- 4. Lay Damp Proof Course (DPC) at plinth top (usually 40-50 mm rich concrete with waterproofing compound).

Above Plinth Level (Superstructure):

- 1. Clean and wet the plinth/DPC surface thoroughly.
- 2. Establish corner leads (corners) perfectly plumb using plumb bob and spirit level.
- 3. Stretch mason's line between corners for alignment and horizontal level.
- 4. Lay bricks with frog pointing upwards, maintaining uniform mortar joint thickness (8–10 mm) and correct bond pattern (English/Flemish).

OR

Q2 (OR). General Principles & Precautions in Brick Masonry

5 MARKS

Answer Summary / मुख्य बिंदु:

- 1. **Soaking Bricks:** Bricks must be soaked in clean water for at least 2 hours before use to prevent absorption of water from mortar.
- 2. **Bonding & Joints:** Vertical joints in alternate courses should be strictly staggered (no continuous vertical joints). Mortar joints should not exceed 10 mm.
- 3. **Frog Direction:** Bricks must be laid with their frog facing upwards to form a proper mortar key.
- 4. **Plumb and Level:** Masonry must be regularly checked for verticality (using plumb bob) and horizontality (using spirit level).
- 5. **Height Limit & Curing:** Masonry height raised per day should not exceed 1.5 meters. Curing must be done continuously for 7 to 14 days.

Q3. Formwork (Shuttering) Details for RCC Beams and Slab Floors

5 MARKS

Answer Summary / मुख्य बिंदु:

- **Beam Formwork:** Consists of bottom soffit board supported on vertical props/posts, and two side vertical sheeting panels braced with cleats and battens. Side shutters are tied across using wire or bolts.
- **Slab Formwork:** Consists of horizontal decking plates/plywood sheets resting on joists/runners, supported by vertical steel props or timber posts with adjustable heads.
- **Requirements & Details:**
 - Rigidity: Must withstand concrete dead load, live load of workers, and vibration impact without excessive deflection.
 - Watertightness: Joints must be sealed with tape or sealant to prevent slurry leakage.
 - Propping & Removal: Easily erectable and removable without causing shock/damage to green concrete. Release agent (oil) applied to contact surfaces.

OR

Q3 (OR). Step-by-Step Procedure for Cement Concrete Flooring

5 MARKS

Answer Summary / मुख्य बिंदु:

- **1. Preparation of Sub-grade:** Compact earth, lay 10-15 cm thick layer of sand/gravel/rubble, and ram thoroughly. Wet the base.
- **2. Base Concrete:** Lay 7.5 cm to 10 cm thick base concrete layer of 1:4:8 or 1:5:10 proportion.
- **3. Topping Layer & Proportions:** Divide floor area into panels (glass/metal strips). Lay topping layer (usually 1:2:4 ratio - 1 part cement, 2 parts sand, 4 parts coarse aggregate) of 25-40 mm thickness.
- **4. Laying & Trowelling:** Spread concrete evenly, compact with straight edge, and finish surface smoothly using steel trowel.
- **5. Curing:** Wet curing by ponding or moist gunny bags for minimum 7 to 10 days.

SECTION - B: SHORT ANSWER TYPE QUESTIONS (18 MARKS)

Q4. Purpose of Slope (Camber) and Standard Ratios in Flooring

3 MARKS

Purpose: Slope (camber) is provided to ensure quick and smooth drainage of water towards drain outlets, preventing water stagnation, slip hazards, and dampness.

Standard Ratios:

- Courtyards & Open Terraces: 1 in 36 to 1 in 40
- Bathrooms & Wash areas: 1 in 50 to 1 in 60
- Indoor Living Rooms / Rooms: 1 in 80 to 1 in 100 (or minimal slope towards doors)

Q5. Scaffolding Definition and Comparison (Single vs. Double)

3 MARKS

Scaffolding Definition: A temporary structure erected to support workmen, materials, and equipment at heights during construction or repair.

- **Single Scaffolding (Bricklayer's):** Consists of a single row of standards parallel to the wall. Putlogs have one end supported on scaffold ledgers and the other end inside holes made in the wall. Used for brick masonry.
- **Double Scaffolding (Mason's):** Consists of two rows of standards independent of the wall. Putlogs rest entirely on ledgers of both rows (no holes made in the wall). Used for stone masonry and high-rise structures.

Q6. Steps for Safe Installation of Single Scaffolding

3 MARKS

- 1. Prepare firm, level base and place sole plates/base plates beneath vertical standards.
- 2. Fix upright standards vertically at spacing of 2 to 2.5 meters.
- 3. Attach horizontal ledgers to standards at vertical intervals of 1.2 to 1.5 meters using clamps/couplers.
- 4. Insert putlogs horizontally, resting one end on ledgers and inserting the other end into wall holes.
- 5. Secure cross-bracings, lay tight working wooden/steel boards, and install guard rails and toe-boards.

Q7. Maintenance of Stone Masonry (Removing Stains)

3 MARKS

- **Iron Stains:** Treated and washed with a solution of oxalic acid or sodium citrate/hydrosulfite followed by clean water wash.
- **Oil Stains:** Cleaned using poultice prepared with organic solvents (benzene, acetone, or trisodium phosphate) combined with an inert filler (fuller's earth).
- **Smoke/Soot Stains:** Scrubbed with warm water containing household detergent/ammonia, or mild scrubbing with soft wire brushes and steam cleaning.

Q8. Advantages and Disadvantages of English Bond vs Flemish Bond**3 MARKS****Advantages of English Bond:**

- Stronger and provides better structural strength (considered strongest bond in brickwork).
- Easier to construct; requires less skilled labor compared to Flemish bond.

Disadvantages of English Bond:

- Less pleasing aesthetic appearance compared to Flemish bond.
- Requires slightly more bats and facing bricks for neat finished faces.

OR**Q8 (OR). Four Hand Tools in Brick Masonry & Functions****3 MARKS**

- 1. **Trowel:** Used for lifting, spreading, and shaping mortar in joints.
- 2. **Plumb Bob:** Used to check vertical alignment (plumbness) of walls and corners.
- 3. **Spirit Level:** Used to check horizontal surface level of brick courses.
- 4. **Brick Hammer:** Used for cutting bricks into required shapes/bats and tapping them into position.

Q9. Joining New Brickwork with Old Brickwork**3 MARKS**

- 1. **Toothing:** Projecting alternate brick headers (tooth) left in existing masonry so that new work can be keyed into them.
- 2. **Racking Back:** Stepping back the courses of old masonry at an angle during initial construction so new work can be bonded smoothly later.
- 3. **Block Bonding:** Leaving vertical recesses (blocks) 1 to 2 courses high at intervals in old work to receive corresponding block projections from new work.

OR**Q9 (OR). Ashlar Masonry: Ashlar Fine & Ashlar Chamfered****3 MARKS**

Ashlar Masonry: Masonry built using finely dressed, accurately cut stones with very thin mortar joints (< 3 mm).

- **Ashlar Fine Masonry:** Every stone is cut, dressed square on all faces, and finely bedded. Face joints are perfectly smooth and do not exceed 3 mm thickness. Gives a smooth, elegant finish.
- **Ashlar Chamfered Masonry:** The exposed front margins/edges of stones are bevelled (chamfered) at an angle of 45° to a depth of about 25 mm, giving a distinct architectural appearance.

SECTION - C: VERY SHORT ANSWER TYPE QUESTIONS (12 MARKS)**Q10. Main Purpose of Formwork / Shuttering****2 MARKS**

Answer: Formwork acts as a temporary mold or container to hold fresh wet concrete in desired shape, size, and position until it gains sufficient structural strength to support itself and applied loads safely.

Q11. Four Essential Requirements of Good Formwork (IS Standards)**2 MARKS**

- 1. Strong enough to bear all dead and live loads without excessive deflection.
- 2. Rigidly constructed and braced horizontally/diagonally.
- 3. Tight joints to prevent cement slurry leakage.
- 4. Easy to erect and strip without damaging concrete surface.

Q12. Stripping Time Definition & Minimum Values**2 MARKS**

Stripping Time: The minimum time required after concrete placing before formwork/props can be safely removed.

- Vertical column shuttering: **16 to 24 hours (1 day)**
- Beam soffit props (span < 6m): **14 days** (Soffit formwork can be removed in 7 days, props remain 14 days)

Q13. Definition & Main Cause of Efflorescence**2 MARKS**

Definition: Whitish powder/crystalline deposit formed on the outer surface of brick walls.

Main Cause: Presence of soluble salts (alkalies/sulfates) in raw clay/bricks or mortar, which dissolve in moisture and deposit on surface upon evaporation.

Q14. PPE Required for Working at Heights on Scaffolding**2 MARKS**

- 1. Full-body Safety Harness with lanyard & anchorage point.
- 2. Safety Helmet (Hard hat) with chin strap.
- 3. Non-slip Safety Shoes/Boots.
- 4. Safety Gloves and Safety Goggles.

OR

Q14 (OR). Four Mechanical Tools/Machines in Modern Flooring**2 MARKS**

- 1. Floor Polishing / Grinding Machine
- 2. Concrete Power Trowel / Float
- 3. Concrete Surface Vibrator / Screed Vibrator
- 4. Tile Cutting Machine

Q15. Difference Between Ashlar and Rubble Masonry (Dressing & Joint Thickness)**2 MARKS**

1. Dressing: Ashlar uses finely dressed, perfectly squared stone blocks; Rubble uses undressed or roughly dressed irregular stones.

2. Joint Thickness: Ashlar masonry has very thin joints (< 3 mm); Rubble masonry has thick, wide mortar joints (up to 12–20 mm).

OR

Q15 (OR). Definition of Queen Closer and King Closer**2 MARKS**

Queen Closer: A brick cut lengthwise into two equal halves (width cut to half, length remains full). Placed next to quoin header to create lap.

King Closer: A brick cut in such a way that the width at one end is half and length at one end is half (triangular corner piece cut off).

SECTION - D: OBJECTIVE TYPE QUESTIONS (15 MARKS)**Answer Key for Questions 16 to 30 (1 Mark Each)**

Q. No.	Correct Option / Answer	Explanation / Remarks
Q.16	b) Granite and gneiss	Granite & gneiss are heavy, dense, hard, and durable igneous/metamorphic rocks suitable for marine/heavy structures.
Q.17	b) 20 cm × 10 cm × 10 cm	Standard nominal size includes 10mm mortar thickness (actual modular brick size is 19cm × 9cm × 9cm).
Q.18	a) Cracking in the brickwork	Freezing of absorbed water expands inside pores, causing internal pressure leading to disintegration and cracking.
Q.19	b) Vertical side of a door or window frame	Jambs are the vertical sides or faces of a wall opening for doors/windows.
Q.20	c) Putlog	Putlogs are horizontal transverse members placed perpendicular to wall to support platform boards.
Q.21	b) Composite material	Terrazzo is a composite material made of marble chips embedded in cement mortar matrix.
Q.22	a) Clay and sand	Ceramic tiles are manufactured by shaping, drying, and firing mixtures of natural clay, quartz sand, and minerals.
Q.23	b) Spirit level	Spirit level resting on a long wooden straight edge is used to verify horizontal levels across surfaces.
Q.24	a) Switch off the fan.	An imperative sentence gives a command, direction, or request.
Q.25	b) Self-motivation	Self-motivation drives an individual to complete tasks independently without external encouragement.
Q.26	b) Ctrl + C	Ctrl + C is the universal computer shortcut key to copy selected content.
Q.27	b) Prevents data from getting corrupted by malware	Antivirus software detects, neutralizes, and protects system data from viruses and malware.
Q.28	parallel (समानांतर)	A Ledger is a horizontal member running parallel to the building wall.
Q.29	Standard (स्टैंडर्ड)	Standards are upright vertical posts resting on base plates.
Q.30	Bed (बेड joint)	The horizontal mortar layer on which bricks/stones are laid is called a Bed joint.