## BIRLA INSTITUTE OF TECHNOLOGY \& SCIENCE, PILANI (RAJ.)

[^0]Q. 2 Multiple type questions $(10 \times 1=10)$

1. Based on basic wind speed, India is divided into $\qquad$ zones
a) 2
b) 4
c) 6
d) 8
2. Earthquake imposes inertial forces in $\qquad$
(b) Horizontal direction
c) Vertical direction
d) No direction
a) Both horizontal \& vertical direction
3. The portion located between ground level and floor level is
c) Basement
d)Slab
a) Footing
b) Plinth
4. The width of column should not exceed $\qquad$ the thickness of it.
a) 2 times
b) 3 times
c) 4 times
d) 5 times
5. Unit weight $\left(\mathrm{kg} / \mathrm{m}^{3}\right)$ of Brick:
a) 1200
b) 1500
c) 1900
d) 2400
6. Live load ( $\mathrm{kN} / \mathrm{m}^{2}$ ) for residences:
a) 1
b) 2
c) 4
d) 6
7. Consider the following statements
8. SPT is conducted by pushing a cone into soil at the rate of $2 \mathrm{~cm} / \mathrm{s}$.
9. SPT results are unreliable in deposits containing large no. of boulders.
10. Dutch cone is a static penetrometer.

Which of these statements is/are correct?
a) 1 and 3
(b) 1,2 and 3
(c) 1 and 2
(d) 2 and 3
8. Pier foundation is also called as
a) Caisson
(b) Box
(c) Bridge
(d) Girder
9. In a continuous footing, the loads from the individual columns
a) Transfer either directly to the footing slab or through a longitudinal beam.
b) Transfer directly only to the footing slab and not through a longitudinal beam.
c) Do not transfer directly to the footing slab but through a longitudinal beam.
d) None of the above.
10. For a raft, differential settlement is not likely to exceed
a) 1 cm
(b) 2 cm
(c) 3 cm
(d) 4 cm
Q. 3 Find the dimensions of a combined Trapezoidal footing for two columns A and B, spaced 2.5 metres centre to centre, carrying loads of 400 kN and 600 kN respectively. Column A is 40 cmx 40 cm in size and column B is 60 cmx 60 cm in size. The safe bearing capacity of the soil may be taken as $200 \mathrm{kN} / \mathrm{m}^{2}$. Footing is not to project more than 0.4 m beyond the outer faces of the columns. Consider the weights of column (assume a suitable height and unit weight).
Q. 4 (a) Resources A and B are such that the maximum number of each resource needed on any day must be paid throughout the project (whether needed or not). Shift the activities and interrupt activities where necessary to minimize the number of resource units of A and B constantly employed so that project is not delayed. Give first priority to resource A. Assume that all activities can be interrupted. How many minimum units of each resource will be constantly employed with no delay in project's normal duration? What will be cost of the project if wages for A is Rs. 1000/- per day and for B, it is Rs. 500/- per day?

| Activity | Resource | Duration | Activity | Resource | Duration |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  | A | B |  | A | B |  |  |
| $1-2$ | 0 | 2 | 5 | $3-6$ | 2 | 2 | 5 |
| $1-3$ | 2 | 1 | 1 | -7 | 0 | 3 | 1 |
| $1-4$ | 3 | 0 | 2 | $6-8$ | 3 | 3 | 3 |
| $2-5$ | 1 | 1 | 4 | $7-8$ | 0 | 0 | 4 |

Activity 5-8 is dummy activity
(b) For the same project (part a) the shortest time and longest (crash and de-crash duration) in which the activity can be completed and the increase/ decrease in cost per day for reducing the time of each activity is given. The contract includes the penalty clause of Rs 1000 per day over 7 days and bonus of Rs. 500 per day for less than 7 days. The overhead (Indirect) cost per day is Rs 1600 . The cost of completing the eight activities in normal time is Rs. 65000 . Calculate the lowest cost and the associated project duration.

| Activity | Crash duration | De-crash duration | slope |
| :---: | :---: | :---: | :---: |
| $1-2$ | 4 | 6 | 500 |
| $1-3$ | 1 | 1 | - |
| $1-4$ | 2 | 3 | 300 |
| $2-5$ | 2 | 6 | 800 for first day, and 1200 for subsequent day |
| $3-6$ | 3 | 7 | 800 |
| $4-7$ | 1 | 1 | - |
| $6-8$ | 1 | 3 | 500 |
| $7-8$ | 2 | 6 | 200 |

(c) What will be your suggestion (in term of duration of project) keeping part a and part b in consideration
$(20+20+5)$
Q. 5 For the following data of a project, (a) prepare the month-wise running account bill, (b) prepare the cash inflow S-curve for the contractor, (c) prepare the cash outflow S-curve for the contractor.
> The quoted cost of the contract is Rs. $76,50,000$
Duration of contract: Four months
> The contractor submit the bill at the end of every month and payment is made immediately.
The owner makes an advance payment of Rs. 10 Lakhs, which is to be recovered in four equal installments (each month).
$>$ The construction schedule has been prepared by the contractor and has been approved by the owner (Table below).

| S. <br> No: | Item description | Unit | Total quantity | Rate (Rs.) | Amount (Rs.) | Quantities to be executed in |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  | Month 1 | Month 2 | Month 3 | Month 4 |  |
| 1 | Earthwork in excavation | $\mathrm{m}^{3}$ | 500 | 50 | 25,000 | 500 |  |  |  |
| 2 | R.C.C. | $\mathrm{m}^{3}$ | 1,000 | 4,000 | $40,00,000$ | 250 | 500 | 250 |  |
| 3 | Brickwork | $\mathrm{m}^{3}$ | 2,000 | 1,000 | $20,00,000$ | 500 | 600 | 900 |  |
| 4 | Sanitary works | L.S | ---- | --- | $2,00,000$ |  |  | $50 \%$ | $50 \%$ |
| 5 | Electrical works | L.S | ---- | --- |  |  |  | $50 \%$ | $50 \%$ |
| 6 | Woodwork | L.S. | --- | --- | $2,50,000$ |  |  | $50 \%$ | $50 \%$ |
| 7 | Finishing work | $\mathrm{m}^{2}$ | 4,750 | 200 | $9,50,000$ |  |  |  | 4750 |

L.S.: Lump sum

## Additional constraints and assumptions:

- The cost for the contractor to execute a particular item is 90 per cent of their quoted rates (cost of the project).
- Assume that there is delay of one month occurs in paying to the subcontractors, material suppliers, and plant and machinery supplier.
- Retention is 10 per cent of billed amount in every bill. Fifty per cent retention amount is payable after one month of practical completion, while remaining 50 percent is payable four months later.


[^0]:    Q. 1 Write T for true and F for False with justification. Answer will not fetch any marks if justification is not given. Wrong answer with justification will fetch you $\mathbf{1 0 0 \%}$-ve marks. $(10 \times 1.5=15)$

    1. Arches can be constructed only in RCC.
    2. Hotels come under mercantile type of buildings
    3. Mat foundation is a type of deep foundation.
    4. Plate load test is reliable because it reflects the true behavior of foundation stratum below the proposed level of foundation and extending up to large depth below.
    5. The bearing capacity of a footing always gets affected by the location of Ground Water Table.
    6. Plate load test is reliable because it reflects the true behavior of foundation stratum below the proposed level of foundation and extending up to large depth below.
    7. Terzaghi's bearing capacity theory can be applied to deep foundations.
    8. Electrical resistivity method of subsurface investigation is capable of detecting only the strata having different electrical resistivity.
    9. Grillage strap footings are constructed at shallow footing depth and low soil bearing capacity.
    10. In strap footings, net upward soil pressure ( $\mathrm{p}_{\mathrm{o}}$ ) is different for individual footings.
