GANPAT UNIVERSITY

B.Tech Semester VIII (Civil Engineering)

REGULAR EXAMINATION April - June 2015

2CI801- ADVANCED STRUCTURAL DESIGN

Time: 3 Hours   Total Marks: 70

Instructions: 1. Make suitable assumptions wherever necessary.
                  2. Figures to the right indicate full marks.
                  3. IS-456:2000, IS-800:2007, IS-875(I,II,III) & Steel Table are permitted.

SECTION-I

Q-1   A counterfort retaining wall has a height of retaining earth is 6.5m. The   **12**
top surface is horizontal behind the wall. The soil behind the wall is a well
drained medium dense sand with following properties:

Unit wt. $\gamma = 17 kN/m^3$

Angle of internal friction $\Phi = 25°$

The material under the wall base is the same as above with S.B.C. of
$150 kN/m^2$. The coefficient of friction between base and soil is 0.55.
Design the stem and counterfort using M20 grade concrete and HYSD
reinforcement of grade Fe415.

Q-2 (A)   Design Stem of retaining wall to retain the earth 3m high. The top surface   **8**
is horizontal behind the wall but subjected to a surcharge of $18 kN/m^2$. The
soil behind the wall is a well drained medium dense sand with following
properties:

Unit wt. $\gamma = 17 kN/m^3$

Angle of internal friction $\Phi = 30°$

The material under the wall base is the same as above with S.B.C. of
$150 kN/m^2$. The coefficient of friction between base and soil is 0.6. Design
the wall using M20 grade concrete and HYSD reinforcement of grade
Fe415.

(B)   Distinguish between Active and Passive earth pressure.   **4**

OR

Q-2   Design a cantilever retaining wall to retain a level earth of 3m above   **12**
basement level. The angle of repose of soil is 30°. The unit weight of soil
is $18 kN/m^3$. The coefficient of friction between soil and concrete is 0.6.
The S.B.C. of soil is $180 kN/m^3$. Use M20 concrete.

Q-3   Write down short note on: **11**
(i) Janssen's theory
(ii) Airy's theory

Q-3   A silo with internal diameter 4m, height of cylindrical portion 22m and   **11**
central opening with 0.5m is to be built to store wheat. Design the silo
using M20 grade concrete and Fe415 steel. Given:

Unit weight of wheat   = 9 kN/m^3
Angle of internal friction   = 30°
Angle of wall friction   = 0.75φ while filling
                                = 0.60φ while emptying
Pressure ratio $p_h/p_v = K = 0.5$ while filling
Use Janssen's theory for pressure calculations.

SECTION-II

Q-4   Design of Angle Purlin for fink type truss span of 16m pitch ¼ and, using   **12**
AC sheet for Covering a roof bay width 4m, height of building 12m and
location Ahmadabad, length of industrial building is 48m, $F_y=250$N/mm^2
& $E = 2 \times 10^5$ N/mm^2.

Q-5   Design a column section for industrial building having axial force 1200kN   **12**
having moment of 210kNm.
$F_y=250$N/mm^2 & $E = 2 \times 10^5$ N/mm^2.

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

Q-5 (A)   Design of top cord member for Gable type of truss span of 16m pitch ¼   **6**
having tension force of 240kN and compressive force of 80kN.
$F_y=250$N/mm^2 & $E = 2 \times 10^5$ N/mm^2.

Q-5 (B)   Design of Vertical main tie member N type of truss span of 20m pitch ¼   **6**
having tension force of 190kN and compressive force of 70kN.
$F_y=250$N/mm^2 & $E = 2 \times 10^5$ N/mm^2.

Q-6 (A)   Give the difference between Bunkers and Silos with neat sketches.   **3**
(B)   Design side walls and hopper bottom of a rectangular bunker of capacity   **8**
550 kN to store coal using M20 concrete and Fe415 steel. Unit weight of
coal is 8 kN/m3. Angle of repose of coal, φ=25°.

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

Q-6   Design side walls and hopper bottom of a circular bunker of capacity 400   **11**
kN to store coal using M20 concrete and Fe415 steel. Unit weight of coal
is 8.5 kN/m3. Angle of repose of coal, φ=25°. Give the check for direct
stress and shear stress.

END OF PAPER