INTEGRAL COACH FACTORY

Selection to the post of Assistant Executive Engineer (Gr-B) in Level 8 of VII PC scales (Pre-revised scale of PB -2, Rs 9300-34800 + 4800 GP) through LDCE selection – Engineering Department

PAPER-I

Time : 3hours **Max Marks: 150** **Date: 17.05.2017**

General Instructions:

1. Answers shall be written in the Answer booklet only
2. Employees name shall not be written anywhere in the answer booklet except in the fly leaf
3. Candidates are allowed to take question booklet with them
4. **Candidates are allowed to bring only calculators.**
5. **Answers to multiple choice questions shall be written in capital letter like A,B,C,D only.**

Section – I

1. Expand **ANY 7** of the following **(7x2=14M)**
   a. RTI
   b. CSO
   c. RITES
   d. RCF
   e. DEMU
   f. CONCOR
   g. RVNL
   h. CRIS
   i. RDSO
   j. MRVC
   k. RPF

2. Write station code of **ANY 6** of the following railway stations **(6x2=12M)**
   a. New delhi
   b. Egmore
   c. Tirupati
   d. Kanyakumari
   e. Vijayawada
   f. Nagpur
   g. Madurai
   h. Nagercoil

Note: The following questions from 3 to 11 carries 1M each. Answer all the questions from 3 to 11. **(9x1= 9M)**

3. Which of the following is used in pencil
   A. Graphite
   B. Silicon
   C. Charcoal
   D. Phosphorous
4. Thar desert is located in
   A. Bihar
   B. Gujarat
   C. Rajasthan
   D. Orissa
5. The largest producer of mica in Asia is
   A. Indonesia
   B. Malaysia
   C. Myanmar
   D. India

6. The rock formations that cannot store ground water are called
   A. Aquifers
   B. Aquicludes
   C. Perched aquifer
   D. Sprin
7. What does EPROM stands for
   A. Electric programmable read only memory
   B. Erasable programmable read only memory
   C. Evaluable philotic random optic memory
   D. None of the above
8. National academy of Indian railways is situated at
   A. Varanasi
   B. Nasik
   C. Vadodara
   D. Secunderabad
9. Who invented the first controllable flying airplane
   A. South brothers
   B. Bright brothers
   C. Wright brothers
   D. Lidenbergh brothers
10. Who was the first Indian captain of Indian test cricket team
   A. Vijay Hazare
   B. C K Naidu
   C. Lala Amaranath
   D. Vijay Merchant
11. NITI Aayog is formed in place of
   A. Planning commission
   B. Election commission
   C. Central bureau of investigation
   D. Central vigilance commission

Answer any one of the following questions (12 or 13 only)

12. Write short notes on **(3x5= 15M)**
   a. Division of states/UT into regions as per official language rules
   b. Conditions to fulfil to consider a person having proficiency in Hindi as per official language rules
   c. Rules to be followed for communications between central government offices of various regions as per official language rules.

OR

13. Write short notes on **(3x5= 15M)**
   a. Swacha bharat program
   b. Recent Demonetisation in india
   c. Renewable energy sources

Section – II

Note: Choose the correct answer . Answer all questions which carry 1 mark each

(45x1= 45M)

1. To find the area of a land which type of compass survey is used?
   A. Closed traverse
   B. Open Traverse
   C. Both of the above
   D. None of the above
2. What is the RF of a scale of 1 cm = 1000m
   A. 1:100
   B. 1:1000
   C. 1:10000
   D. 1:100000
3. = = = = = = symbol in survey maps indicates which of the following?
   A. Canal
   B. Metalled road
   C. Un-metalled road
   D. Railway line
4. In a plan, a 10 cm scale drawn shrunks to 9.7 cm. If the scale of the given plan is written as 1:250, what is the actual length of a line which at present shows 10 cm?
   A. 25m
   B. 24.25m
   C. 25.77m
   D. None of the above
5. What is the fundamental principle of surveying?
   A. Working from part to whole
   B. Working from whole to part
   C. Both of the above
   D. None of the above
6. What is the no. Of significant digits in 4.700m
   A. 2
   B. 3
   C. 4
   D. 5
7. Alidade is used in
   A. Chain survey
   B. Compass survey
   C. Plane table survey
   D. Theodolite survey
8. Departure of a traverse side is given by (if l and θ are the length and azimuth of a traverse side)
   A. $l \sin \theta$
   B. $l \cos \theta$
   C. $l \tan \theta$
   D. $l \operatorname{cosec} \theta$
9. To determine the state of stress at any point, how many components are required?
   A. 5
   B. 6
   C. 7
   D. 8
10. What is the relation between shear stress (τ) and complementary shear stress (τ')
    A. $\tau > \tau'$
    B. $\tau < \tau'$
    C. $\tau = \tau'$
    D. None of the above
11. A circular bar 40 mm diameter carries an axial tensile load of 105 kN. What is the maximum tensile stress in the bar?
    A. 83.55 MN/m^2
    B. 83.55 N/m^2
    C. 83.55 kN/m^2
    D. None of the above

12. What is the unit of strain?
    A. mm
    B. cm
    C. m
    D. none of the above
13. The relation between young's modulus (E), Modulus of rigidity (G) and bulk modulus (K) is
    A. E= 9GK/(3K+G)
    B. E= 3GK/(3G+K)
    C. E= 9GK/(3G+K)
    D. E= 3GK/(3K+G)
14. A simply supported beam AB of 6m length is loaded with 10kN of load at 2m from the A end. The moment at B end is equal to
    A. 20kNm
    B. 40kNm
    C. 60kNm
    D. None of the above
15. A cantilever beam AB of length 5m is fixed at A. Self weight of the beam is 2kN/m. A concentrated load of 3kN is applied at free end B. The shear force at a distance of 2m from fixed end A is equal to
    A. 6kN
    B. 6kN/m
    C. 9kN
    D. 9kN/m
16. Euler's buckling load (P_e) for a column of length 'L' , having least moment of inertia as 'I' and young modulus 'E' is given by
    A. $P_e = \pi^2 E I / L^2$
    B. $P_e = \pi E I / L^2$
    C. $P_e = E I / \pi^2 L^2$
    D. $P_e = E I / \pi L^2$
17. Long and short columns generally fail under load due to
    A. Crushing and buckling respectively
    B. Buckling and crushing respectively
    C. Buckling only
    D. Crushing only
18. In the limit state design the partial safety factor for material strength for steel is taken as
    A. 1.5
    B. 1.15
    C. 1.25
    D. 1.35
19. Which circular compression member will have higher strength?
    A. With circular ties
    B. With spiral ties
    C. Without ties
    D. None of the above
20. What are the minimum and maximum %ge of longitudinal reinforcement in columns?
    A. 0.8 % and 6% of gross cross sectional area of column
    B. 0.8 % and 6% of effective cross sectional area of column
    C. 1% and 8% of gross cross sectional area of column
    D. 1% and 8% of effective cross sectional area of column
21. The minimum no of longitudinal bars to be provided in a column are
    A. 4
    B. 5
    C. 6
    D. 7

22. In normal cases, in how many days props under a slab with a span of 4.5m can be removed?
    A. 3 days
    B. 7 days
    C. 14 days
    D. 21 days
23. Side face reinforcement is provided when the depth of the web of the exceeds
    A. 500mm
    B. 750mm
    C. 1000mm
    D. 1250mm
24. The maximum water cement ratio for severe exposure condition is
    A. 0.45
    B. 0.40
    C. 0.38
    D. 0.35
25. Effective width of flange of a T beam fixed at both ends with a effective span of 6m, thickness of web as 25cm and thickness of flange as 120mm as per IS 456 is
    A. 111cm
    B. 157cm
    C. 197cm
    D. 207cm
26. All structural steel normally conform to
    A. IS 226
    B. IS 456
    C. IS 1929
    D. IS 814
27. If the porosity of a soil is 25% then the voids ratio is equal to
    A. 1/2
    B. 1/3
    C. 1/4
    D. 1/5
28. The symbol used to denote silt in IS classification of soil is
    A. G
    B. S
    C. M
    D. C
29. How many cubes to be casted while concreting for a quantity of $36m^3$ in a shift?
    A. 4
    B. 8
    C. 12
    D. 16
30. As per IRS code of practice for RCC, the bridges in coastal areas like Chennai to be designed for
    A. 50 years
    B. 80 years
    C. 100 years
    D. 120 years
31. As per IRS code of practice for RCC, the minimum cover to be provided from durability consideration for column subjected to mild environment exposure is
    A. 25mm
    B. 40mm
    C. 50mm
    D. 75mm
32. Computer software generally used for analysis and design of RCC members is
    A. AutoCAD
    B. FEM
    C. STADD
    D. PERT
33. If the bulk density of the soil is $20.9kN/m^3$ and water content is 10%, the dry density is
    A. $19\ kN/m^3$
    B. $20\ kN/m^3$
    C. $19.3\ kN/m^3$
    D. $21.9\ kN/m^3$

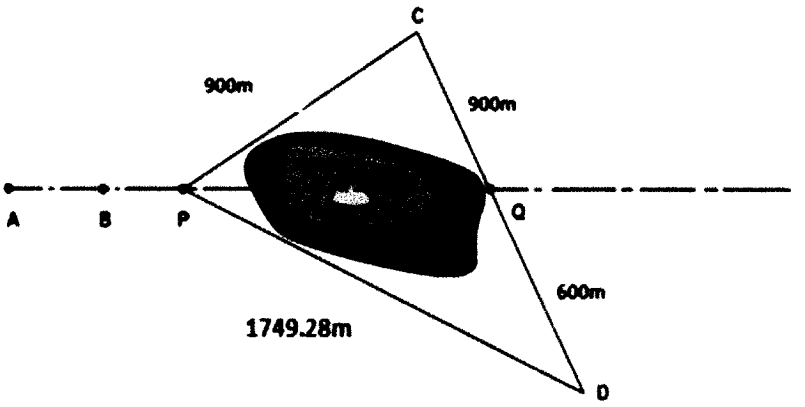
34. In Rankine's earth pressure theory, the coefficient of wall friction for sandy soils is taken as
    A. Zero
    B. 0.15
    C. 0.3
    D. 0.33
35. Soil bearing capacity theories are developed by
    A. Terzaghi
    B. Meyerhof
    C. Both of the above
    D. None of the above
36. Venturimeter works on
    A. Bernoulli's theorem
    B. Bohr's theorem
    C. Terzaghi's principle
    D. Rankine's theorem
37. The loss of head, due to friction , in a pipe of 1m dia and 15km long, which carries water with a velocity of 1m/s is (Assume coefficient of friction as 0.005 and neglect minor losses)
    A. 14.29m
    B. 14.79m
    C. 15.29m
    D. 15.79m
38. Total maximum dissolved solids permissible in drinking water as per Works manual in mg/l is
    A. 300
    B. 400
    C. 500
    D. 600
39. Chlorine is used in treatment of water for
    A. Sedimentation
    B. Filtration
    C. Aeration
    D. Disinfection
40. The estimated water supply per head in workshops as per works manual in litres is
    A. 10
    B. 15
    C. 20
    D. 30
41. Scour sluice is provided at
    A. Highest point of pipe line
    B. Lowest point of pipe line
    C. Anywhere in the pipe line
    D. None of the above
42. The residual pressure in distribution pipe for 2 storied building is
    A. 7m
    B. 12m
    C. 17m
    D. 22m
43. The maximum no of 20mm dia service pipes permitted for connection to a 100mm dia main pipe are
    A. 26
    B. 36
    C. 46
    D. 56
44. Minimum dia of sewer in plain areas is
    A. 150mm
    B. 200mm
    C. 250mm
    D. 300mm
45. Sludge digestion in septic tanks is
    A. Aerobic
    B. Anaerobic
    C. Both of the above
    D. None of the above

SECTION -III

Answer any three questions. All questions carry 20 marks each.

1. (A) Write short notes on open and closed traverse. **5M**

   (B)During measurement of distance, a pond had been come across the path. Let P and Q are the stations selected on the opposite side of the pond. A line PC = 900 m, was set out on one side of PQ, and a line PD =1749.28m was set out on the other side, such that CQD was in a straight line. The length of the lines CQ and QD are 900m and 600m respectively. Determine the desired distance PQ.
   (Graphical method is not permitted) **5M**



   (C)A closed-loop traverse was run among stations A, B, C and D having following observation

Sides	Length (m)	Azimuth
AB	372.222	0° 42'
BC	164.988	94° 42'
CD	242.438	183° 04'
DA	197.145	232° 51'

   Find the consecutive coordinates of the station and find out the magnitude and direction of the closing error if it exists. **10M**

2. (A) Briefly describe the errors in plane table surveying and the good practices to minimise those errors. **10M**

   (B)Briefly describe setting of a simple circular curve with Theodolite **10M**

3. Briefly describe **(5x4 = 20M)**
   a. Stress
   b. Strain
   c. Poisson's ratio
   d. Principal planes
   e. Hook's law

4. (A) A soil has void ratio = 0.72, moisture content = 12% and G_s= 2.72. Determine its
   i. Dry unit weight **10M**
   ii. Moist unit weight, and the
   iii. Amount of water to be added per m^3 to make it saturated.
   Use γ_w as 9.81kN/m^3

   (B) The diameter of a pipe changes from 20cm at point A which is 5m above datum to 5cm at point B which is 3m above datum. The pressure and velocity at point A are 5kg/cm^2 and 1m/s respectively. Determine the intensity of pressure at B (Assume no frictional losses). **10M**

5. Write short notes on **(4x5 = 20M)**
   a. Influence lines for BM and SF of a simply supported beam
   b. Basic requirements for using STADD software for analysis and design
   c. Specifications of a good quality of bricks
   d. Compaction and consolidation

6. Write short notes on **(4x5 = 20M)**
   a. Working and limit state design
   b. Shallow and deep foundations
   c. Active and passive earth pressure
   d. Water audit

7. A square RCC column of 350mm size with 4-25mm dia bars is subjected to an axial load of 600 kN and moment of 12 kNm about x-x axis.
   a. Calculate the maximum stresses in concrete and steel. **15M**
   b. Also check whether section is safe. **5M**

   Consider M20 concrete and Fe415 HYSD reinforcement.
   (Use working stress method)
   Data for use:

   i. Clear cover for column: 40mm
   ii. Allowable stress σ_{cbc} and σ_{cc} for M20 concrete is 7 N/mm^2 & 5 N/mm^2 respectively.
   iii. Allowable stress σ_{st} and σ_{sc} for Fe415 HYSD bars is 230 N/mm^2 & 190 N/mm^2 respectively.

**********END**********