

CIVIL ENGINEERING

ONE MARKS QUESTIONS

1. Mohr's circle for the state of stress defined

by $\begin{bmatrix} 30 & 0 \\ 0 & 30 \end{bmatrix}$ MPa is a circle with

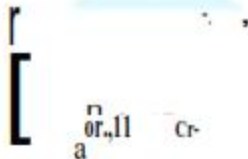
- center at (1,0) and radius 30 MPa
- center at (0,1) and radius 30 MPa
- center at (10,0) and radius 30 MPa
- center at (30,1) and zero radius

2. A long shaft of diameter 10 is subjected to twisting moment T at its ends. The maximum normal stress acting at its cross-section is equal to

- zero
- $\frac{16T}{\pi d^3}$
- $\frac{32T}{\pi d^3}$
- $\frac{MT}{IT}$

3. The buckling load $P = 10 \frac{EI}{L^2}$ of the column AB in figure, as K_1 approaches infinity,

becomes $a \frac{EI}{L^2}$



Where a , r equal to

- 0.25
- 1.00
- 2.05
- 4.00

If the characteristic strength of concrete f_c is defined as the strength below which 0.01 more than 50% of the test results are expected to fall, the expression for f_{ck} in terms of mean strength f_m and standard deviation S would be

a. $f_c = 0.16458$

b. $f_c = 1.6458 S$

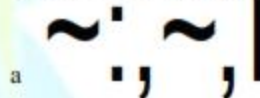
c. $f_c = 1.6458 S$

d. $f_c = 1.6458 S$

5. Which of the following statement is NOT true in the context of capillary pressure in soil?

- Water is under tension in capillary zone
- Pore water pressure is negative in capillary zone
- Effective stress increases due to capillary zone
- Capillary pressure is more in coarse grained soils

6. For steady flow in a fully penetrating well in a confined aquifer, the drawdowns at radial distances of r_1 and r_2 from the well have been measured as s_1 and s_2 respectively, for a pumping rate of Q . The transmissivity of the aquifer is equal to



a. $\frac{Q C_n(r_2, s_1)}{2\pi (s_2 - s_1)}$

b. $\frac{Q C_n(r_1, s_2)}{2\pi (s_1 - s_2)}$

c. $\frac{Q C_n(r_1, s_1)}{2\pi (s_1 - s_2)}$

d. $\frac{Q C_n(r_2, s_2)}{2\pi (s_2 - s_1)}$

7. The range of void ratio between which quick sand condition occurs in cohesionless granular soil deposits is

- 11.4-0.5
- 11.6-0.7
- 1.0-0.6
- 1.0-1.1

8. To provide safety against piping failure, with a factor of safety of 5, what should be the maximum permissible exit gradient for soil with specific gravity of 2.5 and porosity, of 0.35?

- a. 0.156
- b. $0.1 < 7$
- c. ()HS
- d. (1,213

Figure given below shows a smooth vertical gravity retaining wall with cohesionless soil backfill having an angle of internal friction ϕ . In the graphical representation of Rankine active earth pressure for the retaining wall shown in figure, length OP represents

- a. vertical stress at the base
- b. vertical stress at a height H/2 from the base
- c. Inten(earth pressure at the base
- d. lateral earth pressure at a height H/2 from the base

A synthetic sample of water prepared by adding 100 mg glucose, 100 mg NaCl, 100 mg Ni_2SO_4 and 100 mg CaCl_2 to 1 liter of pure water. The concentrations of total dissolved solids (TDS) and fixed dissolved solids (FDS) respectively in the solution are equal to

- a. 699 and 59
- b. 510 and 99
- c. (99 and 11)
- d. 699 and 399

11. To determine the BOD of a waste water sample, 50 ml and 100 ml aliquots of the waste water were diluted to 300 ml and

The results were as follows:

Sample (l)	Waste-water volume (ml)	Initial DO (mg/l)	DO after 5 days (mg/l)
1	50	9.2	4.8
2	100	8.1	3.0

Based on the data, the average BOD of the waste water is (mg/l)

- a. 1.95 mg/l
- b. 126.5 mg/l
- c. 107.8 mg/l
- d. 72.2 mg/l

12. The cumulative noise power distribution curve at a certain location is given below.



The value of L_p is equal to

- a. 91 dBA
- b. 90 dBA
- c. 71 dBA
- d. 60 dBA

13. In case of governing equations for calculating wheel load stresses using Westergaard's approach, the following statements are made:

- I. Load stresses are inversely proportional to wheel load.
- II. Modulus of subgrade reaction is useful for load stress calculation.

- a. Both statements are TRUE
- b. I is TRUE and II is FALSE
- c. Both statements are FALSE
- d. I is FALSE and II is TRUE

Name the following data which is plotted by means of Desirables,

- a. Accident
- b. Classified volume
- c. Origin and Destination
- d. Speed and Delay

15.

If aggregate size of 75 mm is 10% retained by sieve, the percentage of elongated aggregates using Leighton gauge, the elongation of aggregate should be

- a. 81 mm
- b. 15 mm

16.

The necessary and sufficient condition for a surface to be called as a 'free surface' is

- a. tensile stress acting on it must be zero
- b. shear stress acting on it must be zero
- c. no point on it should be under any stress
- d. no point on it should be under any stress

17.

A channel with a mild slope is followed by a horizontal channel. When a sleep channel. What gradually varied flow profiles will occur?

- b. M¹. liz. S:
- c. M¹HL.S,
- d. M., HL.S,

18. $\frac{dV}{dt} = \frac{d}{dt} \left(\frac{1}{2} \pi r^2 h \right) = \pi r^2 \frac{dh}{dt}$ from the following. The specific speed of the pump increases with

- a. increase in shaft speed
- b. increase in discharge
- c. increase in gravitational acceleration
- d. increase in head

19. A system defined by the set of differential equations $\dot{x} + 2x = 3u$; $\dot{z} = 2u - 3z$ is

- a. $\dot{x} = 0; \dot{z} = 3$
- b. $\dot{x} = 0; \dot{z} = \frac{1}{2}$
- c. $\dot{x} = 1; \dot{z} = \frac{1}{2}$
- d. Non-existent

20. The differential equation $\frac{dy}{dx} = 2y$ is

- a. solved using the backward method with the boundary condition $y = 1$ at $x = 0$ and with a step size of 1. What would be the value of y at $x = 1$?
- a. 1.33
- b. 1.41
- a. 2.00
- d. 2.33

two MARKS QUESTIONS

31. A thin-walled cylindrical shell of inside radius r is subjected simultaneously to internal pressure p and axial compressive force F at its ends. In order to produce a state of pure shear in the wall of the cylinder, F should be equal to

- a. $\pi r^2 p$
- b. $2\pi r^2 p$
- c. $3\pi r^2 p$
- d. $4\pi r^2 p$

22. Consider the beam AB shown in the figure below. Part AC of the beam is rigid while part CB has the flexural rigidity EI . The horizontal displacement of the free end B is



- a. $\frac{wL^3}{135EI}$
- b. $\frac{wL^3}{180EI}$
- c. $\frac{8wL^3}{135EI}$
- d. $\frac{8wL^3}{180EI}$

23. A simply supported beam AB has the bending moment diagram as shown in the following figure;



- The beam is possibly under the action of following loads
- a. Couples of magnitude 2M at 0
 - b. Couples of magnitude 2M at C and M at B
 - c. Concentrated loads of magnitude 2M at C and M at B
 - d. Concentrated load of magnitude 2M at B

24. A beam with the cross-section given below is subjected to a positive bending moment (causing compression at the top) of 16kNm acting around the horizontal axis. The tensile force acting on the hatched area of the cross-section is



- a. zero
- b. 5.1kN
- c. 8.9kN
- d. 17.8kN

25. If a beam has an angular cross-section subjected to a vertical shear force V , the shear force carried by the upper one-third

- a. is
- b. $\frac{1}{3}V$
- c. $\frac{2}{3}V$
- d. $\frac{1}{2}V$

26. For the section shown below, second moment of the area about an x -axis is 100 cm^4 above the centroidal axis. The area is



27. I-section of a beam is formed by gluing wooden planks as shown in the figure below. If the beam is subjected to a constant vertical shear force of 3000 N , the shear stress at any of the four joints will be subjected to a shear force (in $\text{kN per meter length}$) is



- a. 3.0
b. 4.0
c. 6.0
d. 10.7

Data for Q.28 & Q.29 are given below. Solve the problems and choose the correct answers. Consider a propped cantilever beam ABC under two loads (of magnitude P each as shown) in the tilted position. Flexural rigidity of the beam is EI .



28. The reaction at C is
- $\frac{9P}{16}$ (upwards)
 - $\frac{9P}{16}$ (downwards)
 - $\frac{9P}{8}$ (upwards)
 - $\frac{9P}{8}$ (downwards)
29. The reaction at D is
- $5PL/16EI$ (clockwise)
 - $5PL/16ET$ (anticlockwise)
 - $5PL/16EJ$ (clockwise)
 - $5PL/16EL$ (anticlockwise)

30. Vertical reaction developed at B in the beam below due to the applied load of 10 kN (with $1 \times 10^6 \text{ mm}^2$ cross-sectional area and $3.12 \times 10^8 \text{ mm}^4$ moment of inertia for the members) is



31. Carry-over factor for the beam shown in the figure is
- $\frac{5}{8}$
 - $\frac{1}{2}$
 - $\frac{3}{4}$
 - $\frac{1}{4}$



32. Consider the beam ABCD. The influence line as shown below. The influence line pertains to



- reaction at A, R_A
 - shear force at B, V_B
 - shear force at the left end of C, V_C
 - shear force at the right end of C, V_C
33. Assuming concrete below the neutral axis to be cracked, the shear stress across the depth of a singly reinforced rectangular beam section
- Increases parabolically to the neutral axis and then drops suddenly to zero at the bottom.

- b. increases parabolically to the neutral axis and then remains constant over the remaining depth.
- c. increases linearly to the neutral axis and then remains constant up to the tension steel.
- d. increases parabolically to the neutral axis and then remains constant up to the tension steel.

34. As per IS 456:2000, consider the following statements;

1. The modular ratio considered in the working stress method depends on the type of steel used.

2. There is an upper limit on the nominal shear stress in beams even with shear reinforcement due to the possibility of crushing of concrete in diagonal compression.

3. A slab whose length is 4m, width 2m and is supported by two-way slab for some support conditions.

The correct statements are

- a. 1 and 2
- b. 2 and 3
- c. 1 and 3
- d. 1, 2 and 3

35. Consider the following statements;

1. The ratio of the ultimate moment capacity to the yield moment capacity of a reinforced concrete beam depends on the effective length of the column.

2. In a doubly-reinforced concrete beam, the stress in the compression reinforcement is higher than the stress in the tension reinforcement.

3. If a cantilever is subjected to a uniformly distributed load, the maximum deflection at the free end will be the same as that of a simply supported beam of the same length and load.

The correct statements are

- a. 1 and 2
- b. 2 and 3
- c. 1 and 3
- d. 1, 2 and 3

maximum strain in concrete be limited to 0.0025 (in place of 0.0035). For this, the effective length of the column is taken as 1.05L for beams and 1.6L for columns. The effective length of the column is taken as 1.05L for beams and 1.6L for columns. The effective length of the column is taken as 1.05L for beams and 1.6L for columns.

36. The depth of neutral axis for the balanced condition is

- D. 1410mm
- b. 156mm
- c. 160mm
- d. 15mm

37. The limiting value of the ratio of the depth of the neutral axis to the effective depth of the section is

- a. 0.44
- b. 0.48
- c. 0.42
- d. 0.46

38. Consider the following statement

1. The effective length of a battened column is increased to account for the additional load on battens due to the lateral expansion of column.

2. The effective length of a column in bending depends on the end conditions.

3. The effective length of a column in axial compression depends on the end conditions.

The correct statements are

- a. 1 and 2
- b. 2 and 3
- c. 1 and 3
- d. 1, 2 and 3

39. For the design of welded connections, consider the following statements-

1. The effective length of a column in axial compression is taken as 1.05L for beams and 1.6L for columns.

2. The effective length of a column in bending depends on the end conditions.

3. The effective length of a column in axial compression depends on the end conditions.

Sol. for Q.36 & Q.37 as given below.

For Q.36, the effective length of the column is taken as 1.05L for beams and 1.6L for columns.

e. only 1 prod :-

d. 1.2i111d~

10. When the triangular σ - τ diagram is as shown below, the plastic hinge, the compressive force σ on the section. With σ_y denoting the yield stress, becomes

- a. $\frac{\sigma_y}{4}$
- b. $\frac{2\sigma_y}{3}$
- c. $\frac{\sigma_y}{2}$
- d. $\frac{3\sigma_y}{4}$

41. A sample of saturated cohesionless soil tested in a drained triaxial compression test showed an angle of internal friction of 30° . The deviator stress at failure for the sample at a confining pressure of 2110 kPa is equal to

- a. 100 kPa
- b. 1000 kPa
- c. 600 kPa
- d. 500 kPa

42. The soil below gives the following types of failure: [miter soil slope Old List-I] for these different types of failure,

Mention the item in List-I with the items 10, 2, 5, 1 and select the correct answer from the codes given below the lists:

- List-I
- P. Base failure
- Q. Failure
- R. Failure
- List-II

- 1. Soils above and below the 100 kPa strength
- 2. Soil above the toe is comparatively weaker
- 3. Soil above the toe is comparatively stronger

Codes:

	P	Q	R
a.	1	2	3
b.	2	3	1
c.	2	3	1

d. $\frac{2}{3} \sigma_y$

43. For the soil profile shown in figure below, the minimum number of pressure cells to carry the load for given safety factor of 5 (assuming 100% efficiency for the cells) is equal to

- a. 10
- b. 15
- c. 20
- d. 25

14. In a triaxial compression test, 1.8 kg of moist soil was placed in the mould (volume = 944 cc) after consolidation. A soil sample weighing 18 g was taken from the mould and oven dried for 24 hours at a temperature of 105°C . Weight of the dry sample was found to be 20 g. Specific gravity of soil solid, $G_s = 2.7$. The theoretical value of the dry unit weight of the soil at the water content is equal to

- a. 4.67 kN/m³
- b. 15.8 kN/m³
- c. 16.26 kN/m³
- d. 111.85 kN/m³

15. The effective vertical pressure on a thick homogeneous saturated clay layer 1.5 m thick, consolidated in an undrained soil, the clay layer showed the void ratio decreased from 0.6 to 0.5 by increasing the stress from 100 kPa to 11300 kPa ($G_s = 2.7$).

16. The initial void ratio of the clay layer is
- a. 0.2119
 - b. 0.563

- e. 0.746
c.l. 1.00t)

- ~6. nn. Inial co'solid-liqⁿ seulement llf the clay 10),^m un, 10 ||₁, construction of a structure imposing du .dditiollll -tr^m inlonsity nr20QkP~ 1;
a. 0.10 m
b. (1.25m
c. 0.35m
U. O.SOM

D-I-a for' Q. -IV & Q. -IS lire f,~w^m<low, solve the "robl-m' and chlUse II., correct answers, L(POTitory s, e .m.IYsis was c,nle4 out on u .soil sample llSing • C9III,lelc sel of s!*(i,lrds sieves, Out of SOOg of soil used in the (ent WQg W~ retained 0ⁿ IS 5(1)", sieve. :ISOg l'OS r.!!ined on IS 500P sieve and Hle rem.inlng 50g W3. retained o.o IS -125JLSieve,

- 17. "0 cocJident ofunif(irmly of (he SQil.is
n. 0,9
b. 1.0
c. 1.1
d. 1.2

48. ntc c'as. ilic:lll)n flfb. ~"ik
u. Sl'
b. SW
e. Gt>
d. GW

49. The composition of a certain MSW sample anti speciJTe wvights til' Its "Iriu-u-CU"pCluQllb are given bulo\:

Component	er cent y weigh t	S,,~ilk weight (k ^m ~"l
Fuod waste	50	:100
UM, llld.-v~h	30	500
PJn-licl	10	65
Wood & Yard	10	125

SJiclfie weight ("<Im') of the MSW sample is

- a. 319
b. 217
c. 21(1)
d. 1x>
S.I. lbe m~m indoor ,irhome (hlo,nj,rm IGHCUJ) COIClllrr.iOil in a n(lm wul< determined 10be OAILS)III

Use the following d-t~T = 29; K. P = 1 alflQS!here, R 82.1)5 • 10 ~3m,m/ mol-K, Alom,cIVelghts;C^m 12.H^m 1,(1~35.5. TIUs coucentmtiou expresed in Polts p<:r billion (volume basis, "bv) (i) "qu-IIO
a. 1.00 ppbv
b. 11.20ppbv
c. 0.111 ppbv
d. (y08 PII-V

nu.u for Q.51 & Q.52 are gh...u below, Solve the prQilem- ~-lid chouse correct answers,

In a rapid S.Iel filler, the time ro, reaching particle break through (TAL is defined .s lb. lill) e elapsed ~-!lrLof filter run 10 the lima ill which UI^r lurbialLy of the allluent from the filter is greater than 2.5 N"IU The time lilt reaching terminal head loss (TH) l-datined 3.. the lime."lapsed ii-um the <ant or the filul' run til the time when head loss across ilic 511". is greater lh.,* 3m.

51. The effect of increa-in8 the filter depth (while "deping all other Q(illdlLions-unle) od Tllnd TFCIS
n. Tn rtoQeSS<:8 end Tu decreases
b. ~Qth l'0.,*4Ttl incfe.,~e
c. Ta decreases and l", increases
d. both 'l'cand TR decrease
52. The "Hect of increasing' the filler lo.ding ...Ja (while keeping ill oilier cenditions ~-3mc)u 'Ja and 'ro IS
n. 'rll i",;R13~es apd TITdecre:J~'~
h. both l'l)and Tu increase
c. Ta.decreases and T" increases
d. both Tn And T., OOOI^mt

O.Rtn for Q.53 " Q.5-1 urc giwn ll'low. Soil'v th~problems :nd ch(1)l~ correct answer. .

A w-l<contains ll,-rllllowim djsS(I)w:c:dions:
f>Ja-) ~ S6 UlVr: rCa>] ~-to mg/l;
l'M!?' ~- 30 mg/l; ~Aljl 3 mgt!!
nrco 11" 190.mg/l: lClI " t6~"lYl

Water pH " 7.
:tOm~ wtlillhS. (4 .411;Mg. /: H 1 : 17; H : 1:
C! 12: 0 : H: N" : 2: Cl : 35.5

- 5:, The 10,1 hardness i)flbes.mple in mg/l 35 PaCU'ls
s. -18;1
b. 450
c. 242
d. 225

54. The non-carbonate hardness of the sample in fistl as c-CO₂ is
 a. 225
 b. 156
 c. 86
 d. 0
55. DIU in S. 31m², storm event, it was observed that the following (ms other than the following) are negligible. The rainfall was 10 mm/hr, 20 mm/hr and 10 mm/hr respectively. The intensity of rainfall is idealized as Horton's curve with $k = 6.5$ and $t_0 = 8.1$ min. The runoff coefficient is 0.7. The runoff is to be collected in a tank of 10 m² area. The depth of water in the tank at the end of 10 min is
 a. 1.2 m
 b. 11.33 mm
 c. 12.43 mm
 d. 13.63 mm

56. A cultivated field, the soil has porosity of 4.5% and field capacity of 3.8%. The particular soil. The root zone depth is 10 cm. The wilting point is 10% and the consumptive use is 15 mm/d. If the irrigation efficiency is 80%, what should be the frequency of irrigation, such that the water content does not fall below 50%? The maximum available moisture?
 a. 5d
 b. 6.1
 c. 9d
 d. 15d

D-1. r/r Q.57 & Q.58 are given below. Solve the problems and choose correct answers. Fill in the blank (or S-hydrology) due to runoff of intensity i on a slope of S in m/s is given by $Q = 1.48 i A S^{0.5}$ (in m^3/s) where A is in m^2 and Q in m^3/s .

57. What will be the orthocatchment area?
 a. 0.01 m²
 b. 1.3 V 10³ m²
 c. 1.00 km²
 d. 1.21 km²
58. What will be the ordinate of a 1-hour hydrograph, for this catchment in 1-3 h unit?
 a. 0.13 m³/s
 b. 1.20 m³/s
 c. 0.27 m³/s
 d. 0.54 m³/s

59. 119UIS IR# 37-19-4 "Guidelines for the Design of Flexible Pavements" and the following: 1.14. Choose the following (If the pavement Number of lanes, 1 vehicle. 2723 when construction is completed. 1/Chld-P Annual gT(w/h fit...nl) L.e. r.f.fic 5.0Q.) Design life of life pavement 10 year.S Vehicle damage factor 2.4

D.A rUI*S%CBR value	NumberMSI11"dar,1	Tut,1 Thclt"%, mm
2.0	20	620
25	25	610
30	30	670
40	40	700

- a. 620 mm
 b. 640mm
 c. 670 "in
 d. 700mm
60. A vehicle moving at 100 kmph on an ascending gradient of 4%. It is to stop to avoid collision with a stationary object. The ratio of lag in brake distance is 6:5. Considering 101-1 reaction time of driver as 2.5 seconds and the coefficient of longitudinal friction is 0.36, the value of ascending gradient (%) is
 a. 3
 b. 4.4
 c. 3.3
 d. 6.5
61. A horizontal curve portion of a 1-lane, undivided highway. A transition curve is to be introduced to the main required super-elevation. The design speed is 60 km/h and radius of the curve is 250 m. The length of wheel base of longest vehicle is 6 m. The "super elevation" is 5% and fill-in of introduction of the transition curve is 1 in 150. The length of the transition curve (m) required, if the pavement is 3.5 m wide about inner edge is
 a. 81.4
 b. 85.0
 c. 915
 d. 110.2

62. FcyrdSigllinga'2'pbnse fixed typ" signal al
 intersection having North.SOU~' and
 Eit1;J-Wesl road where unly sLnligh ahead
 Inlic ls permuted, the 'oHull'inj. (1111)j
 "-II.I'hlc.

Parameter W"=1	"urth	South	EBS'
Design .HOw- flow (PCU/hr)	1000	700	900
Saturation flow f'CUlbr)	2500	2500	3000

Tulu lime lost per ~ycle ls 12 seconds,
 The ~ycle Length (seconds) lIS per
 Web-le~. npproach i.

- a. 67
- b. 77
- c. 87
- d. 91

63. On 'Jl urban road, the free .na,ul speed was
 measured us 70 kmph and the o~ng'
 spacing between the vehicles under jam
 condition is 7.0m. 'llin'C, 'u-flow-density
 equation i. given by:

- f' ; space-mean speed (kmlh);
- \tr= free mean speed (kmph);
- lt- density (1/ellm);
- " = jam d., ~-iry (veil/kill);
- " = (p)iv (veh/hr).

The mximum flow (wMlf) per lane for
 this condition i~equal to

- a. 2000
- b. 2500
- c. 3000
- d. Non~ of the above

64. A Sl,grUl.t. soil sample was tested wilDg
 l'faodrd CDR , appannns and the
 observations are ll_ below.

wad,ko	
~(1.5	
80.S	5.0

AsStulllus, that !b~ lead-penctmiou curvo
 ill ~otiv~x throughout, Li., CBR ".1.," (0,~).
 l)flh~ sample 1,
 n. 6.)
 b. 5.5
 c. 4.4
 d. 3.11

65. The observed magnetic bearing of o lin':
 OR ~ts fould 16 be 18-5" if VIS 1m.,
 discovered that statio 0 hud ll l.,"l
 all rodlon "r 11.5' - 'INC uec hearing of ih.

line OK considerlag n magnetic
 declination of 3.5"EshnJl b.

- a. J80P
- b. 1.87
- c. 190P
- d. 19:\P

66. A Bench M(IF<lk(BM) with Reduced Level
 (R.L.) 155.3(15111 has been c.... blished nr the
 floor of a P)OIII. JI is required to lind out the
 ill. of the underside of Lho roof IR) Of
 the room usllg Spirit Levelling. lhc Dade
 l!HSh(BS) to the BM has been observed as
 1.500m whereas the Fore Sighb (FS) to R.
 has been ..bserved as 0.57501 (Sluff held
 inverted), 'lle RL(III) of R will be
 a. 15.8RCI
 b. 13(>.230
 c. 1.51.38U
 d. 1.57.1160

67. Consider till JOHOWUlg figure, which is a
 extract from a comour "IUP (scale =
 1:20(JOO) Of un area. An alignment (of n
 mad al a ("ling. gradient of 4')~ is to be
 fixo!! from the point, U and beyond. What
 should b. th(l-radius of th~ arc will' 0 us
 th~ center to llo i th~ p<idi. l)l' nlgment OF
 111E_n-t-Odtollt ,lo_the nur?



- a. 0.025 cm
- b. 0.25 cm
- c. 2.5 eru
- d. 5.Uenl

68. l" the figure giv" bdown, tht 1011gth.. PQ
 (WCB t .10") a" d QR (Wel3 : +5")
 t>!p<cLlWl'jip to thlce places ef dclmal



- a. 273.205.938.J86
- b. 171.208.551.81.5
- c. 551.115.551.815
- d. 3-1.11.11.938.156

69. Durin's levelling work. Using gradient using DUDIPY-Level and SuLff of 3m length, 10110,;ng successive temling' we", taken: 1.785, 2.935, 0.3(iO, 1.320. What will be the cQITeCforder (f, l, OOKing lit",... [our readings ill u level >>101:1(85 Bouk Sight. IS : lJl1"mt:dütle Sisbt. FS: F)lre Siglll)
 a. BS, !S. lfs, FS
 b. BS, IS. FS.FS
 c. AS. IS, IS, FS
 d. AS, IS. Bs..FS
70. The velocity field for a flow is given by:

$$\mathbf{V} = (5x - 6y + 7z)\mathbf{i} + (6x + 5y + 9z)\mathbf{j} + (3z + 2t)\mathbf{k}$$
 and the density varies as $\rho = p \exp(-2r)$. In irrotational flow mass is conserved, the value of ρ should be
 a. 12
 b. 10
 c. -8
 d. 10
71. A hydraulic jump occurs in a trapezoidal, horizontal, frictionless channel. The initial depth of the flow is 2m and the discharge per unit width is 10 m³/s. The depth of the flow after the jump is
 a. 0.101
 b. 11.3m
 c. 0.8ru
 d. 1.9m
72. A 100m wide, 10m deep, rectangular channel discharges 1000 m³/s. The design is based on the Manning's equation with the roughness coefficient of 0.015. The depth of the flow is
 a. 0.32111
 b. 0.50m
 c. 2.0(m
 d. 3.20111
73. The flow of a fluid in a pipe is laminar. The velocity profile is parabolic. The maximum velocity is 10 m/s. The average velocity is
 a. 5 m/s
 b. 10 m/s
 c. 15 m/s
 d. 20 m/s
74. The thickness of the boundary layer on a flat plate is 10 mm at a distance of 1 m from the leading edge. The thickness of the boundary layer at a distance of 4 m from the leading edge is
 a. 0.50m
 b. 0.80m
 c. 1.00m
 d. 1.25m
75. The discharge in the pipe is 100 m³/s. The diameter of the pipe is 1 m. The velocity of the flow is
 a. 100 m/s
 b. 0.127 m/s
 c. 0.144 m/s
 d. 0.161 m/s
76. If the flow is reversed, keeping the same discharge, and the pressure drop is 1 section (1 m), the pressure drop is
 a. 188 kN/m²
 b. 549 kN/m²
 c. 586 kN/m²
 d. 61 kN/m²
77. For a given matrix A = one of the eigen values is 3. The other two eigen values are
 a. 2, -5
 b. 3, -5
 c. 2, 5
 d. 3, 5

78. The directional derivative of $f(x, y, z) = 2x^2 - 3y^2 + z^2$ at the point $P(2, 1, 3)$ in the direction of the vector $\vec{v} = -i - 2k$ is

- a. -2.785
- b. -2.145
- c. 1.789

It 1.000

79. A class of 100 students is composed of four batches A, B, C and D, each consisting of 25 students. It is found that the sessional marks of students in Engineering Drawing in batch C have a mean of 6.6 and standard deviation of 2.3. The mean and standard deviation of the marks for the entire class are 5.5 and 1.2 respectively. It is decided by the instructor to normalize the marks of

- a. 6.0
- b. 7.4
- c. 5.1
- d. 1.0

80. A 2nd degree polynomial $f(x)$ has values $f(1) = 4$, $f(2) = 15$, $f(3) = 0$, $f(4) = 2$.

It is to be estimated by applying the Simpson's 1/3 rule to the interval $[1, 4]$. What is the error (denoted as "true value - approximate value") in the estimate?

- a. 4
- b. 3
- c. 1
- d. 0

81. What is the area common to the circles $r = 2a \cos \theta$ and $r = 2a \sin \theta$?

- a. $0.524a^2$
- b. $0.614a^2$
- c. $1.047a^2$
- d. $1.228a^2$

82. Using Green's theorem, the value of the integral $\int_C (x^2 + y^2) dx - (x^2 - y^2) dy$ taken in counter clockwise direction is

- a. $\frac{1}{2}\pi a^2$
- b. $\frac{1}{2}\pi a^4$
- c. $\frac{1}{2}\pi a^3$
- d. $\frac{1}{2}\pi a$

- b. $\frac{\pi}{8} 6a^2$
- c. $\frac{\pi}{8} 6^2 a^2$
- d. 1

83. There are 25 balls in a box. Two of them are defective. If 5 balls are drawn randomly for inspection (i.e., each ball has the same chance of being selected), what is the probability that only one of the defective balls will be included in the sample?

- a. $\frac{1}{2}$
- b. $\frac{1}{3}$
- c. $\frac{1}{4}$
- d. $\frac{1}{5}$

84. A spherical balloon is exposed to the atmosphere. The rate of change of its surface area due to evaporation is proportional to its instantaneous surface area. If the initial diameter of the balloon is 2 cm and the diameter reduces to 1 cm in 3 months, the balloon completely evaporates in

- a. 6 months
- b. 9 months
- c. 12 months
- d. infinite time

85. The solution of the differential equation $y'' + 2y' + 2y = 0$ is

- a. $y = e^{-x} (\cos x + \sin x)$
- b. $y = e^{-x} (\cos x - \sin x)$
- c. $y = e^{-x} (\cos x + 2\sin x)$
- d. $y = e^{-x} (\cos x - 2\sin x)$