

Time: 3 Hours

Marks: 80

- Instructions: (1) Question No.1 is compulsory
(2) Answer any *Three Questions* from the remaining questions.
(3) Draw neat sketches wherever essential.

- Q.1. Solve any Five out of Six 4 Marks each
A Classify the basic construction materials used for building construction.
B Explain merits of admixtures.
C Write any five types of Paints used in Building construction.
D What is damp proofing and explain importance of damp proofing.
E Explain manufacturing process of concrete.
F What is RMC? Explain with advantages & disadvantages.
- Q.2. Solve any Four out of Six 5 Marks Each
A What is Seasoning of timber? Explain any one natural method of seasoning of Timber in Details.
B Enlist properties of hardened concrete. Explain any one in detail.
C Explain various laboratory test of aggregate. Explain any one test in detail.
D Explain factors affecting on selection of construction material?
E Explain different types of Glass used in construction.
F Write short note on Mortar with its various types.
- Q.3.A Solve any Two out of Three 6 Marks Each
A Explain the difference between Fine and Course Aggregates with respect to their properties and function in construction.
B Write note on Types their uses of cement. (any 6)
C Explain stepwise procedure of Concrete Mix Design by IS 10262 Method.
- Q.3.B Solve any Two out of Three 4 Marks Each
A What is durability ? Explain factors affecting on durability of concrete.
B Explain difference between Nominal Mix and Design Mix of concrete.
C Why RMC is becoming popular in days than concrete in-situ? Explain.
- Q.4. Solve any Five out of Six 4 Marks Each
A What is NDT of concrete ? When it is required ?
B Which are the various tests to find out workability of concrete? Describe any one test of workability in detail.
C Explain in difference between waterproofing admixture and Bonding admixture.
D Explain laboratory tests of cement. (any 3)
E Explain manufacturing process of burnt clay brick.
F Explain wood properties required for use in construction.

- Q.5. Solve any Two out of Three 10 Marks Each
- A Explain importance of water/cement ratio of concrete.
- B Why curing is required to fresh concrete? Explain any 3 methods of curing of concrete.
- C Draw a proportionate sketch of RMC plant and various component parts.
(any 5)
- Q.6. Solve any Four out of Five 5 Marks Each
- A What is Durability ? Explain factors affecting on Durability of concrete.
- B What is varnish? Where it is used?
- C What are the various methods of NDT? Describe any one with sketch.
- D What is sound insulating material? Give any two material which can used for sound insulating purpose.
- E Write short note on “ Plaster of Paris” used in construction.
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(3 Hours)

[Total Marks: 80]

N.B.: 1) Question No. 1 is Compulsory.

2) Answer any THREE questions from Q.2 to Q.6.

3) Figures to the right indicate full marks.

Q.1 (a) Fit a straight line for following data (5)

X	5	6	7	8	9	10	11
Y	11	14	14	15	12	17	16

(b) Let X be a continuous random variable with probability density function (5)

$$f(x) = kx^2(1 - x), 0 \leq x \leq 1$$

Find k, mean and variance.

(c) Evaluate $\int_c \bar{z} dz$ where c is unit circle $|z| = 2$. (5)

(d) Can it be concluded that the average life span of an Indian is more than 70 years, if a random sample of 100 Indians has average life span of 71.8 years with standard deviation of 8.9 years? (5)

Q.2 (a) The probability of an item produced by a certain machine will be defective is 0.05. If the produced items are sent to the market in packets of 20 find the number of packets containing at least 2 defective items in consignment of 1000 packets. (6)

(b) Evaluate $\int_c \frac{3z^2+z}{(z^2-1)} dz$ where c is $|z - 1| = 1$ (6)

(c) Obtain two lines of regression and coefficient of correlation (8)

X	62	64	65	69	70	71	72	74
Y	126	125	139	145	165	152	180	208

Also estimate Y when X=73.

Q.3 (a) Calculate Correlation coefficient between the variables x and y for the following data (6)

X	10	20	30	40	50
Y	35	42	55	60	70

(b) Find the work done in moving a particle in the force field (6)

$$\vec{F} = 3xyi - 5zj + 10xk \quad \text{along } x = t^2 + 1, y = 2t^2, z = t^3 \text{ from } (2,2,1) \text{ to } (5,8,8).$$

(c) The sizes of 10000 items are normally distributed with mean 20cm and standard deviation 4 cm. Find the expected number of items having size: (8)

i) between 18cm and 23 cm, ii) above 26cm.

- Q.4** (a) Following result were obtained from two samples each drawn from two different populations A and B (6)

Population	A	B
Sample Size	20	17
Sample SD	60	50

Test the hypothesis that variance of A greater than variance of B.
Given $(F(0.05) = 2.21 \text{ for } d.o.f. 16 \text{ and } 19)$

- (b) Use Green's theorem to evaluate $\int_c (2x^2 - y^2) dx + (x^2 + y^2) dy$ where c (6)
is the boundary of the surface enclosed by the lines $x = 0, y = 0, x = 2, y = 2$
- (c) Find all possible Laurent's series expansion of the function (8)
 $f(z) = \frac{2-z^2}{z(1-z)(2-z)}$ about $z = 0$.

- Q.5** (a) The sales-data of an item in six shops before & after a special promotional campaign is as follows- (6)

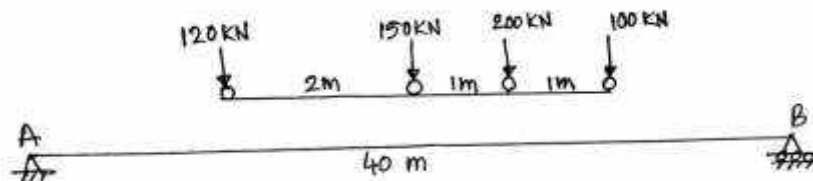
Shops	A	B	C	D	E	F
Before campaign	53	28	31	48	50	42
After campaign	58	29	30	55	56	45

Can the campaign be judged to be a success at 5% level of significance?

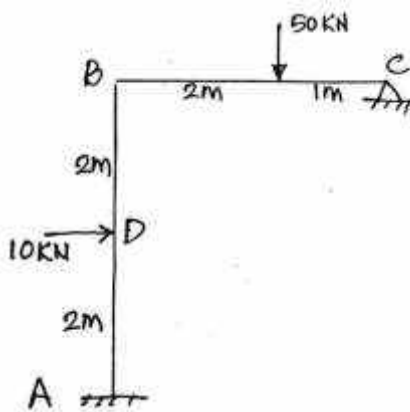
- (b) Using Stoke's Theorem evaluate $\int_c \vec{F} \cdot d\vec{r}$ where $\vec{F} = yi + zj + xk$ and c (6)
is the boundary of the surface of $x^2 + y^2 = 1 - z, z > 0$.
- (c) The theory predicts the proportion of beans in the four groups A, B, C, D (8)
should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory?

- Q.6** (a) A newly constructed flyover is likely to collapse. The chance that design is (6)
faulty is 0.5. The chance that the flyover will collapse if the design is faulty is 0.95 otherwise it is 0.30. If the flyover collapsed what is the probability that it collapsed because of faulty design?
- (b) Three fair coins are tossed. Find the expectation and the variance of the (6)
number of heads. Also find moment generating function.
- (c) Show that $\vec{F} = (2xyz^2)i + (x^2z^2 + z \cos(yz))j + (2x^2yz + y \cos(yz))k$ (8)
is conservative. Find scalar potential such that $\vec{F} = \nabla\phi$ and hence, find the work done in displacing a particle from $(0,0,1)$ to $(1,\pi/4,2)$ along the straight line.

- (b) Find the absolute maximum BM on the girder with 100 kN load leading and moving from left to right 10 Marks

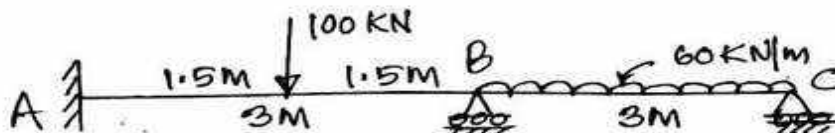


- Q4** (a) Analyse the given frame as shown in Figure using Flexibility method and draw BMD 10 Marks

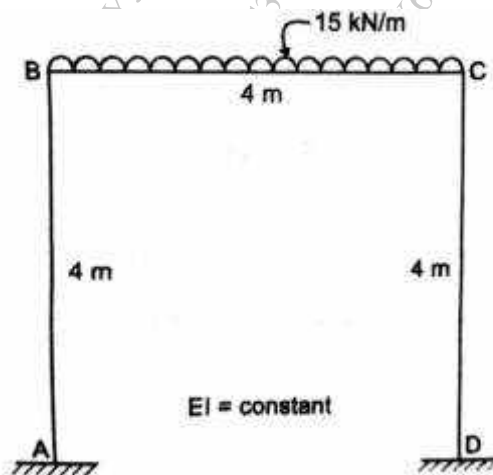


- (b) Analyse the given beam as shown in Figure using Stiffness Method and draw BMD

10 Marks



- Q5.** (a) Analyse the given frame as shown in Figure using Moment Distribution method and draw BMD 10 Marks



Time: 3-hour

Max. Marks: 80

- N. B. 1) Question No. 1 is compulsory
 2) Attempt any three questions out of remaining questions
 3) Assume suitable data if needed and state it clearly

Q1 Attempt any four of the following

5 marks each

- A** Explain the method of measuring horizontal angle between the two points.
B Define contour, contour interval and horizontal equivalents.
C Explain different uses of total station.
D Enlist and mention the function of each of the instrument required for plane table surveying
E A 20 m chain was found to be 8 cm too long after chaining 1730m. It was 10 cm too long at the end of day work after chaining a total distance of 2880m. If the chain was correct before commencement of the work, find the true distance.

Q2

10 marks each

- A** The staff readings taken along a leveling operations are given below. The instrument was shifted after taking 5th, 10th, 14th and 19th readings. Arrange the data in tabular form and find the R.L. of all the points by rise and fall method if the 12th reading was taken to a BM of R.L. 185.635.
 1.355, 1.605, 2.125, 0.685, 1.365, 2.015, 1.355, -1.385, 0.685, 2.105, 1.685, 1.155, 1.105, 2.015, 1.085, 1.345, 1.355, -2.015, 1.305, 1.655, 1.685 and 1.455.
- B** The following bearings was taken while conducting a close traverse with a compass in a place where local attraction was suspected. At what stations do you suspect local attraction? Find the included angles, the corrected bearings for local attraction and for declination of 10°W calculate true bearings.

Line	FB	BB
AB	36°00'	216°45'
BC	98°15'	276°
CD	201°45'	23°15'
DA	322°45'	142°45'

Q3

A Attempt the following questions

5 marks each

- i. Explain use of planimeter.
 ii. Explain any two types of leveling

B

10 marks

In Traverse ABCDE the following lengths and bearings were recorded. Calculate the missing length and bearing of line EA.

Line	length	W.C.B.
AB	204	87° 30'
BC	226	20°20'
CD	187	280°
DE	192	210° 50'
EA	?	?

Q4 A Attempt the following questions

5 marks each

- i Enlist various application of GPS in surveying
- ii Write short note on temporary adjustment of theodolite.

B Two straights meet at an intersection angle $126^{\circ} 48'$ and chainage 1190 m. These straights are to be joined by circular curve of radius 300 m. Calculate the necessary data for setting out curve by method of offset from long chord. **10 marks**

Q 5 Attempt the following questions

10 marks each

A Determine The following observations were taken with tacheometer fitted with an anallatic lens, the staff being held vertically. The constant of the tacheometer is 100. Calculate the RL of B and the distance between A and B.

Inst.St.	Staff station	Height of Instrument	Vertical angle	Staff readings	
P	BM	1.255	$-4^{\circ} 20'$	1.325,1.825,2.325	RL OF BM
	A	1.255	$+6^{\circ} 30'$	0.850,1.600,2.350	= 255.750 m
B	A	1.450	$-7^{\circ} 24'$	1.715,2.315,2.915	

B The offsets (in m) taken from a chain line to a curved boundary are given below

Ch.	0	5	10	15	20	25	35	45	55	65
Offsets	2.5	3.8	8.4	7.5	10.5	9.3	5.8	7.8	6.9	8.4

Find the area between chain line, the first and last coordinate and the boundary by

- 1) Trapezoidal rule
- 2) Simpson's rule

Q 6 Attempt the following questions

10marks each

A Explain in detail block contouring project.

B Describe the field procedure of setting out a simple circular curve by Rankine's method.

Duration: 3 hour

Marks: 80

N.B. 1) Question No.1 is Compulsory.

2) Attempt any Three questions from remaining questions.

3) Assume suitable data where required and clearly state the same.

4) Figures to the right indicate full marks.

Q.1 Attempt any Four

(20)

- Derive an expression for the equivalent size of the Pipe to replace the pipes in series.
- What are the important Characteristics of laminar flow? Give the examples.
- Write a note on Turbulent Boundary layer on a Flat Plate.
- What is meant by boundary Layer? Why does it Increase with distance from the upstream edge?
- State practical applications of the momentum equation.
- Explain principle of dimensional homogeneity and Check dimensional homogeneity with example.

Q.2.a) Two Sharp ended pipes of diameter 60mm and 120 mm respectively, each of length 120m are connected in parallel between two reservoirs Which have a difference of level of 12m. If the Coefficient of friction for each pipe is $(4f) 0.32$. Calculate the rate of flow for each pipe and also the diameter of a single pipe 100m long, Which would give the same discharge? If it were Substituted for the original two pipes. (10)

- Two reservoirs are connected by a pipe line consisting of two pipes, one of 16 cm diameter and length 8 m and the other of diameter 23 cm and length 20m length. If the difference of water levels in two reservoirs is 6m, calculate the discharge and draw the energy gradient line. Take $f=0.04$ (10)

Q.3. a) Explain the phenomenon of water hammer. Obtain an expression for the rise of pressure when the flowing water in a pipe is brought to rest by closing the valve gradually. (10)

- Oil of specific gravity 0.82 is pumped through a horizontal pipeline 160 mm in a diameter and 2.5km long at the rate of $0.016 \text{ m}^3/\text{s}$. The pump has an efficiency of 68%. and requires 7.5kw to pump the Oil. i) What is the dynamic viscosity of the oil? ii) Is the flow laminar? (10)

Q.4.a) A 16cm diameter. Pipeline Carries a discharge of $0.28 \text{ m}^3/\text{sec}$ calculate for the wall shear stress, and height of roughness projections. $N = 0.75 \times 10^{-6} \text{ m}^2/\text{s}$, $f=0.025$. (10)

- For the velocity distribution for laminar boundary layer flows given as $\frac{u}{U} = \frac{3}{2}(y/\delta) - \frac{1}{2}(y/\delta)^3$ find the expression for boundary layer thickness ' δ ' if shear stress T_0 and coefficient of drag (C_D) In terms of Reynolds number. (10)

- Q.5.a)** A square plate of side 2 m is moved in a Stationery air of density 1.3 kg/m^3 with a velocity of 60 km/hr. of the coefficients of drag and lift are 0.2 and 0.8 respectively Determine i) The lift force ii) The drag force iii) The resultant force iv) The Power required to keep the plate in motion. **(10)**
- b)** Bend in pipeline conveying water gradually 0.8m to 0.4m diameter deflects flow through angle of 60° . At larger end the gauge pressure is 172.875 kN/m^2 Determine the magnitude and direction of force exerted on bend i) When no flow ii) Water flow is 886 l/s. **(10)**
- Q.6.a)** i) Write a short note on Froude's number. **(5)**
ii) What are the applications of Model testing. **(5)**
- b)** The efficiency η of a fan depends on density ρ , dynamic viscosity μ of the fluid, Angular Velocity ω , diameter D, discharge Q. Express the efficiency η in terms of dimensionless parameter. **(10)**
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