(3) SE-sem-IV-2012-civil-Am-IV 15/5/17

Q.P.Code: 11346

(Old Course)

(3 Hours) [Total Marks: 100

Instructions:

1) Question 1 is compulsory.
2) Solve any four questions out of remaining six questions.
3) Use of statistical table is permitted.

Q.1 a) Evaluate $\int_0^{1+i} (x^2 + iy)\,dz$ along the path y = x. 5

b) If the tangent of the angle made by the line of regression of y on x is 0.6 and $\sigma_y = 2\,\sigma_x$, find the correlation coefficient between x and y. 5

c) Discrete random variable has p. d. f. given below 5

x	-2	-1	0	1	2	3
P(x)	0.1	0.1	0.2	0.2	0.3	0.1

Find mean and variance.

d) The life time of a certain brand of electric bulb may be considered a random variable with mean 1200 hours and standard deviation 250 hours. Using the Central limit theorem find the probability that the average lifetime of 60 bulbs exceeds 1250 hrs. 5

Q.2 a) Using Residue theorem evaluate $\oint_C \frac{e^{2z}}{(z-\pi i)^3}\,dz$, where C is |z-2i| = 2 6

b) In a normal distribution 7 % items are under 35 and 89 % are under 63. Find the mean and standard deviation. 6

c) Verify Gauss's Divergence theorem for $\bar{F} = 4x\,i - 2y^2\,j + z^2\,k$ taken over the region bounded by $x^2+y^2 = 4$, z = 0, z = 3 8

[Turn over

Q. 3 a) A continuous random variable x has probability distribution function 6

$f(x) = A + B x$, when $0 \le x \le 1$. If the mean of the distribution is 1/3, find A and B.

b) Samples of two types of electric bulbs were tested for length of life and the 6

following data were obtained.

	Type I	Type II
Number of samples	8	7
Mean of the samples (in hours)	1210	1314
Standard deviation(in hours)	36	42

Test at 5% level of significance whether the difference in the sample means is significant.

c) By using Stoke's theorem evaluate $\int_C [(x^2 + y^2)i + (x^2 - y^2)j] \cdot d\bar{r}$ where C is 8

the boundary of the region enclosed by circles $x^2 + y^2 = 4$, $x^2 + y^2 = 16$.

Q4. a) Determine the poles and find the residue at each pole $\frac{z^2 + 1}{(z^2 - 1)(z^2 + 4)}$ 6

b) The average of marks scored by 32 boys is 72 with standard deviation 8 while that 6

of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.

c) Find the coefficient of correlation between x and y for the following data 8

x	98	101	104	107	113	120	125	128
y	65	65	67	68	68	69	68	68

Q.5 a) Find Laurent's series which represents the function $f(z) = \frac{z - 1}{(z^2 - 2z - 3)}$ 6

indicating regions of convergence.

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b) The regression lines of a sample are x + 6y = 6, and 3x + 2y = 10. Find 6

i) Sample means $\bar{x}$ and $\bar{y}$ (ii) coefficient of correlation between x and y.

Also estimate y when x = 12.

c) Verify Green's theorem in the plane for $\oint (x^2 - y)dx + (2y^2 + x)dy$ around the 8

boundry of the region defined by y = 4 and $y = x^2$.

Q.6 a) Fit a Poisson distribution to the following data. 6

X :	0	1	2	3	4
Frequency:	123	59	14	3	1

b) Evaluate $\int_0^{2\pi} \frac{1}{5 + 3\sin\theta} d\theta$ 6

c) In an experiment on immunization of cattle from Tuberculosis the following results 8

were obtained.

	Affected	Not affected	Total
Inoculated	2	10	12
Not inoculated	8	4	12
Total	10	14	24

Use Chi-square test to determine the efficiency of vaccine in preventing tuberculosis.

Q7. a) Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-2)(z-3)} dz$, where c is the circle and |z| = 4 6

b) The probability of that a man aged 60 will live up to 70 is 0.65.What is the 6

probability 6 that out of 10 such men now at 60 at least 7 will live up to 70 ?

c) A vector field $\bar{F}$ is given by $\bar{F} = (ye^{xy}\cos z)i + (xe^{xy}\cos z)j - (e^{xy}\sin z)k$ 8

Prove that it is irrotational and hence find its scalar potential.

SA-I - CE sem-IV OLD 25/05/2

Q.P.Code:16646

OLD COURSE

Time : 3Hrs **Marks : 100**

N.B.: (1) Question No.1 is **compulsory**.

(2) Attempt any **Four** questions out of **remaining** questions.

(3) Assume suitable **data** if required but **justify** the same

Q. 1 **Attempt any four** **(20)**

(a) Explain the principle of superposition with example.

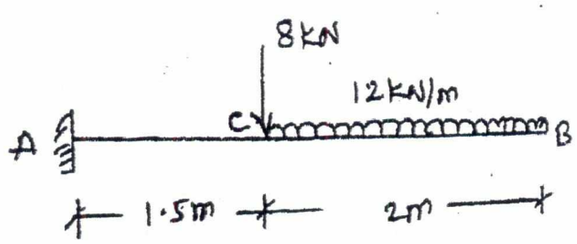
(b) What is meant by conjugate beam? State the Mohr's Theorem no I & II as applied to the conjugate beam.

(C) Define ILD and explain its importance in Structural analysis

(d) Explain function of each component of suspension bridge consisting of suspension cable and three hinged stiffening girder.

(e) Explain the concept of unsymmetrical bending. Also state the condition where unsymmetrical bending in flexural members can occur.

Q. 2 **(a)** Using moment area method, determine the vertical deflection and slope at free end of the beam as shown in fig. **(10)**



(b) Determine slope and deflection at C in the overhanging beam ABC as shown in fig below. Take E= 2 x 10^5 N/mm^2 I = 100 x 10^6 mm^4 **(10)**

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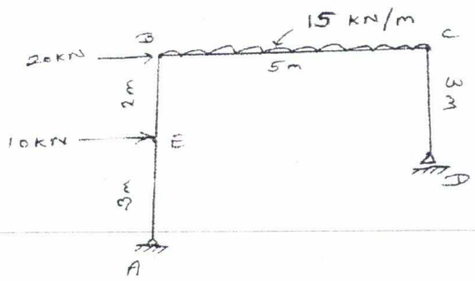
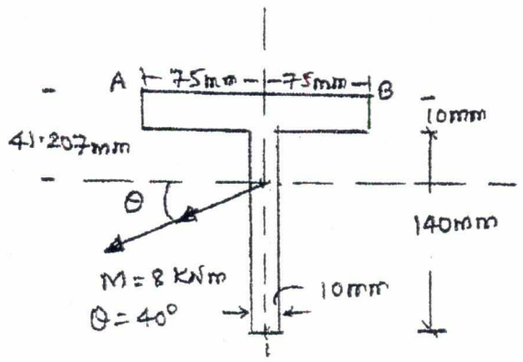
Q.3 **(a)** Analyse the rigid jointed frame shown in fig. Draw Free Body Diagram of each member separately and construct AFD, SFD, BMD for the same. **(14)**



Q.3 **(b)** A symmetrical cable of span 100m with central dip 15m is loaded with UDL of 30kN/m. Find the maximum and minimum tension in the cable. **(06)**

Q. 4 **(a)** Figure shows the cross section of a T beam with its CG 41.207mm below the top surface AB. The c/s is subjected to sagging bending moment of 8kNm acting in plane as shown in figure. Find the maximum compressive and tensile stresses induced in c/s. Also locate the neutral axis position. **(10)**



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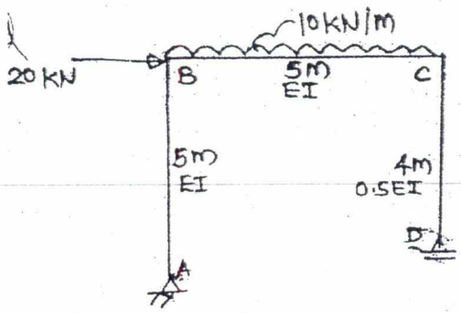
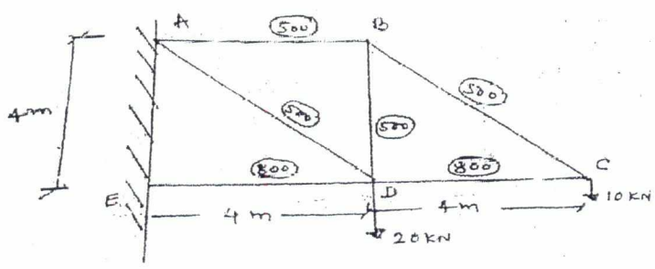
(b) For the pin jointed plane frame as shown in figure, calculate vertical deflection of point D as shown in figure. **(10)**



Q. 5 (a) Find the vertical deflection of the truss shown in figure at the joint C. Cross-sectional areas in mm^2 of all the members are shown in figure. **(10)**

Take $E = 2 \times 10^5$ N/mm^2.



Q. 5 (b) Draw ILD for members 4,5 and 6 of truss shown in fig. Assume that the load **(10)**

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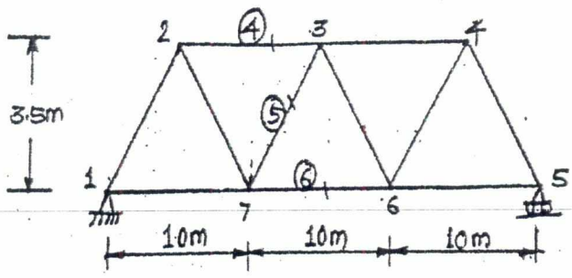
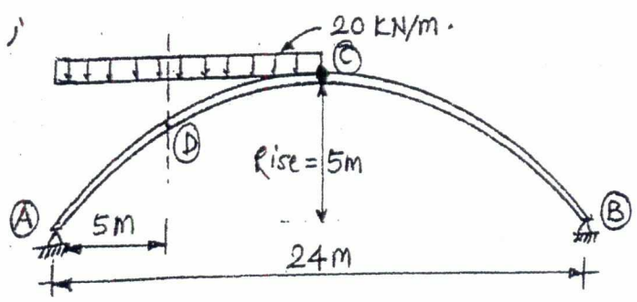
moves along the bottom chord.



Q. 6 (a) **(12)**

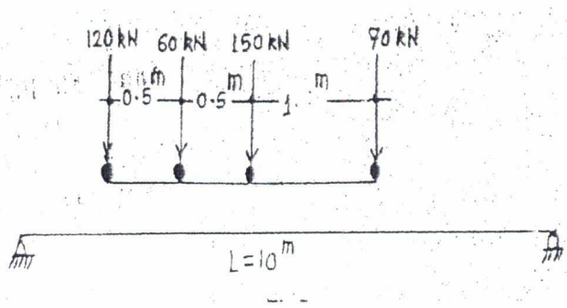
A three hinged symmetrical parabolic arch is loaded as shown in figure. Calculate: i) Support Reaction ii) Maximum bending moment in the portion AC and BC (Draw neat sketch). iii) Normal thrust and radial SF at D.



(b) A column of hollow circular section with 200mm external diameter and 100mm internal diameter is of length 4m. The column is pinned at both ends. The column carries a load of 100kN at an eccentricity of 40mm. Find the stresses produced at extreme fibre of the column section. Take E=200Gpa. **(08)**

Q.7 (a) The load shown in fig moves from left to right on a girder of span 10m find **(10)**

the absolute max. BM for the girder.



Q.7 **(b)** The cable of a suspension bridge has a span of 50m and a central dip of 6.25m. Each cable is stiffened by a girder hinged at ends at mid span. There is a uniform dead load of 10kN/m over the whole girder and in addition a live load of 32kN/m, 12m long. Find the maximum cable tension when the live load is situated on the half of stiffening girder with its right end over the central hinge. **(10)**