

Seat No.	
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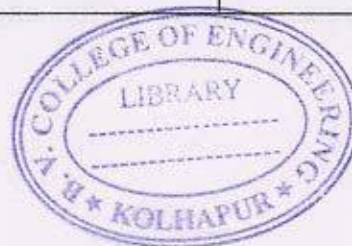
S.E.(Civil) (Semester -III) Examination, November - 2019**SURVEYING-I****Sub. Code : 63339****Day and Date : Tuesday, 26-11-2019****Total Marks :100****Time : 10.00 a.m.to 1.00 p.m.**

- Instructions :
- 1) Answer any THREE questions from EACH section.
 - 2) Figures to the RIGHT indicate FULL marks.
 - 3) Assume suitable data if NECESSARY and state them clearly.
 - 4) Answers shall be supported by adequate sketches.

SECTION-I

- Q1) a) What is meant by combined correction in levelling? Derive its equation[5]
- b) Differentiate between radiation and intersection. [5]
- c) Show that the reciprocal leveling eliminates the effect of atmospheric refraction and earth's curvature as well as any error in the line of collimation of the instrument. [8]
- Q2) a) What are different methods of contouring? Describe any method along with sketch. [6]
- b) The following observations were made during the testing of a dumpy level. [10]

Instrument at	Staff reading at	
	A	B
A	1.725	2.245
B	2.145	3.045

**P.T.O.**

- i) Is the instrument in adjustment.
- ii) What should be the staff reading A during the second set up to the instrument for the line of collimation to be exactly horizontal?
- iii) What should be R.L. of B if R.L. of A is 450.00m?

- Q3) a) What is a zero circle? what is need of finding the area of zero circle?[6]
 b) Calculate the area of the zero circle with the following data (assume $M=100$) [10]

IR	FR	Position of anchor point	Remark
7.775	4.825	outside the figure	The zero crosses the index mark once clockwise
2.325	8.755	inside the figure	The zero crosses the index mark twice anticlockwise

- Q4) Write in Brief [16]
- a) Auto level
 - b) Principle of equating backsight and foresight
 - c) Use of telescopic alidade in plane table survey
 - d) Write note on sensitivity of a bubble tube.

SECTION-II

- Q5) a) Draw a neat sketch showing suitable portion of main scale and complete vernier scale representing an angle of $122^{\circ} 33' 4''$. Also indicate the step by step procedure to set this angle on vernier 'A'. [4+4]

- b) Explain spire test for adjusting a Transit theodolite. [5]
- c) Justify the statement -Even though the least count of a theodolite is 20 seconds, angles can be measured to an accuracy of 7 to 8 seconds. [4]
- 16) a) Following observations were taken from stations P and Q. Calculate the length and bearing of the line AB. [9]

Line	PA	PQ	QB
Length in m.	125	200	150.50
Reduced Bearing	S 60°30' W	N 30°30' E	N 50°15' W

- b) Explain different methods of distributing closing error in a closed theodolite traverse. Also, indicate the situations where they are preferred. [8]
- 17) a) Name different methods of locating soundings and explain in brief any Two of them. [7]
- b) Describe the construction and uses of Box sextant. [5]
- c) Explain with a neat sketch the method of transferring the alignment inside a tunnel. [5]
- 18) a) An angle measuring instrument was set up at a point 175 m away from a tower. The angle of elevation to the top of the tower was 25° 30' whereas the angle of depression to the bottom was 3° 45'. Calculate the reduced levels of top and bottom of tower if the reduced level of instrument axis was 1750.00 m. [5]
- b) Explain the procedure for carrying out preliminary survey for a proposed irrigation canal. [6]
- c) What are the advantages of plotting the traverse by total co-ordinates? How do you select the total co-ordinates of first station? [5]



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Total No. of Pages : 2

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S.E. (Civil) (Part - II) (Semester - IV) (Revised)
Examination, November - 2019
BUILDING DESIGN AND DRAWING
Sub. Code : 63348

Day and Date : Wednesday, 20 - 11 - 2019

Total Marks : 100

Time : 2.30 p.m. to 6.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Assume suitable data, if required and clearly mention it.

SECTION - I

- Q1) a) List the various factors to be considered in selection of good site for residential building. [5]
- b) Explain 'Aspect' as a principle of planning a building. [5]

OR

- b) Write short note on "Grouping" as a principle of planning a building. [5]

Q2) A residential building (G+1) is to be planned for following requirements :

- Living - 15 to 20 m²
- Kitchen - 10 to 12 m²
- Dinning - 10 to 12 m²
- Master Bed - 14 to 16 m² + Attached Toilet
- Children Bed - 12 to 14 m²
- Guest Bed - 12 m² + Attached Toilet
- Entrance & Porch
- Sanitary Block as per requirement
- Staircase

Size of the plot is 16m × 25m. A 9m side road is parallel to the shorter side of the plot on East side. Draw to a suitable scale the following

- a) Building Plans - Ground and First Floor [25]
- b) Site Plan of building [5]



P.T.O.

Q3) Write short notes on any two :

[10]

- a) Salient features of a Green building
- b) Roominess
- c) Low cost housing
- d) Orientation
- e) Rehabilitation of a building
- f) Circulation

SECTION - II

Q4) a) Explain the systems of plumbing with neat sketches. [10]

b) Explain with neat sketch the importance of rain water harvesting. [6]

OR

b) Explain the various systems of wiring. [6]

Q5) a) What is the necessity of ventilation? Explain any one ventilation system in detail. [8]

b) What do you mean by sound insulation? What are the advantages of sound insulation? [8]

OR

b) What are different acoustical defects? Explain any one in detail. [8]

Q6) Write short notes on any three :

[18]

- a) Characteristics of good paint
- b) Objective of plastering
- c) Types of pointing
- d) Wall cladding and dado work
- e) Internal wall finishes - POP & wall paper
- f) Types of paints



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S.E. (Civil) (Semester - IV) (Revised)
Examination, November - 2019
SURVEYING - II
Sub. Code : 63345

Day and Date : Thursday 14 - 11 - 2019

Total Marks : 100

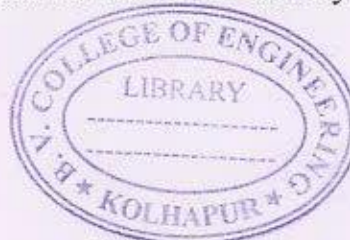
Time : 2.30 p.m. to 5.30 p.m.

- Instructions : 1) Attempt any three questions from each section.
 2) Figures to the right indicates full marks.

SECTION - I

- Q1) a)** Explain the principle of stadia tacheometry. [5]
 b) Determine the distance between the points P and Q from the following data.
 RL of P = 123.265m
 Height of tacheometer at P = 1.280m
 Vertical angle at P = $+4^{\circ}25'20''$
 Staff reading at Q = 1.545, 1.905, 2.265
 Also determine the RL of Q if the staff is held vertical and $K = (f/i) = 100$
 and $C = (f+d) = 0$ [7]
 c) Describe the field method of determining the constants of tacheometer. [5]
- Q2) a)** Explain in detail satellite station and reduction to centre [8]
 b) What is meant by phase of a signal? [4]
 c) What is base line? State the points to be considered for selection of base line. [5]
- Q3) a)** Explain Celestial Latitude and longitude system. [6]
 b) Define the terms
 i) Zenith
 ii) Visible horizon
 iii) Hour angle [6]
 c) Explain the significance of Polaris in field astronomy. [4]

P.T.O.



4) Write a short note on (any four)

[16]

- a) Tacheometric Contouring
- b) Astronomical triangle
- c) Classification of triangulation figures
- d) Principle of E.D.M.
- e) Intervisibility of stations

SECTION - II

15) a) Explain the compound curve with a neat sketch? Write the relationships between different parameters? [6]

- b) Two straights intersect at chainage of 1280 m., the deflection angle for the two straights is 32° . It is required to set out a simple circular curve of radius 210 m., to connect the two straights. Calculate all the data necessary to set out the curve by the method of deflection angles with peg interval of 20 m. [10]

16) a) Draw the neat sketch of a mirror stereoscope and explain the principle on which it works? [6]

- b) Define: [6]

- i) Flying height
- ii) Principle point
- iii) Isocentres

- c) Calculate the maximum number of photographs required to cover a fairly level area with the following data. Scale of photography is 1:10,000. Area is 100 km². Longitudinal overlap is 60%. Side overlap is 30%. Size of photographs is 20 cm × 20 cm. [6]

17) a) Explain electromagnetic energy and its interaction with matter. [8]

- b) Describe in brief the segments of GPS. [4]

- c) Write a short note on the applications of GIS. [4]

18) Write short notes on any four of the following. [16]

- a) Transition curves
- b) Vertical curves
- c) Terrestrial photogrammetry
- d) Applications of remote sensing
- e) Atmospheric windows.

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Total No. of Pages : 3

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No.

S.Y. B. Tech. (Civil) (Semester - III) (CBCS)
Examination, November - 2019
SURVEYING - I
Sub. Code: 73198

Day and Date : Tuesday, 26 - 11 - 2019
Time : 10.00 a.m to 12.30 p.m.

Total Marks : 70

- Instructions :
- 1) Attempt any three questions from each section.
 - 2) Figures to the right indicate full marks.
 - 3) Make suitable assumptions wherever necessary and mention it clearly.
 - 4) Use of non-programmable calculator is allowed.

SECTION - I

- Q1) a) Explain necessity of correction for curvature & refraction with derivation for the same. [5]
- b) The following offsets observations were made during testing of a dumpy level Staff reading at. [7]

Instrument At :	A	B
Midway :	1.875	1.790
Near A :	1.630	1.560

Two pegs A & B are 100m apart & dist. between instrument & A is 10m. Calculate correct staff readings on A & B.

- Q2) a) Define area of zero circle and methods of calculating area of zero circle. [5]
- b) The following offsets from a traverse line to an irregular boundary were measured at points 10.0m apart. [6]

Chainage (m) :	0	10	20	30	40	50	60	70	80
Offset (m) :	6.15	10.92	9.03	11.58	14.22	12.33	9.72	10.32	7.65

Calculate the area enclosed by

- i) Trapezoidal rule
- ii) Simpson's rule

P.T.O.

Q3) a) What is the principle of plane table surveying? Explain the term orientation [6]

b) Explain Intersection method of plane table survey with neat sketch. [5]

Q4) Write short notes on (any three) [12]

- Reciprocal Levelling.
- Indirect contouring.
- Capacity contouring.
- Advantages and Disadvantages of plane table survey
- Sensitivity of bubble tube.

SECTION - II

Q5) a) Explain the Repetition method of horizontal angle measurement with reference to- [6]

- Procedure and recording with relevant example.
- Errors eliminated by this method.

b) A theodolite was set up at a distance of 200 m from a tower. The angle of elevation to the top of the parapet was $8^{\circ}18'$ while the angle to the foot of the wall was $2^{\circ}24'$. The staff reading on the B.M. of R.L. 248.362 with the telescope horizontal was 1.286 m. Find the height of the tower and the R.L. of the top of the parapet. Draw a proper sketch showing tower, instrument position and various parameters used in calculations. [6]

Q6) a) Calculate the consecutive coordinates, closing error and direction of closing error for the traverse ABCDEA. [6]

Line	AB	BC	CD	DE	EA
Length in m	89.31	219.76	151.18	159.10	232.26
Whole circle Bearing	$45^{\circ}10'$	$72^{\circ}05'$	$161^{\circ}52'$	$228^{\circ}43'$	$300^{\circ}42'$

b) The table below gives the lengths and bearings of the lines of a traverse ABCDE, the length and bearing of EA having been omitted. Calculate the length and bearing of the line EA. [5]

Line	Length (m)	Bearing
AB	204.0	$87^{\circ}30'$
BC	226.0	$20^{\circ}20'$
CD	187.0	$280^{\circ}0'$
DE	192.0	$210^{\circ}3'$
EA	?	?

Q7) a) Explain the procedure for carrying out preliminary survey for a new railway alignment. [6]

b) What is hydrographic survey? List down the various purpose for which it is carried out. [5]

Q8) Write short notes on any three of following. [3×4=12]

- Spire Test.
- Deflection angle and its measurement.
- Balancing the Traverse.
- Construction and use of box sextant.
- Transfer of centre line alignment inside a tunnel.



Approximate requirements for mixing water and air content for different workabilities and nominal maximum size of aggregates.

Workability r air content	Water content, kg/m ³ of concrete for indicated maximum aggregate size							
	10 mm	12.5 mm	20 mm	25 mm	40 mm	50 mm	70 mm	150 mm
Non air-entrained concrete								
Slump								
0-50 mm	205	200	185	180	160	155	145	125
0-100 mm	225	215	200	195	175	170	160	140
50-180 mm	240	230	210	205	185	180	170	-
Approximate entrapped air content percent	3	2.5	2	1.5	1	0.5	0.3	0.2

Air-entrained concrete								
Slump								
30-50 mm	180	175	165	160	145	140	135	120
80-100 mm	200	190	180	175	165	155	150	135
150-180 mm	215	205	190	185	170	165	160	-
Recommended average total air content percent								
Mild exposure	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0
Moderate exposure	6.0	5.5	5.0	4.5	4.5	4.0	3.5	3.0
Extreme exposure	7.5	7.0	6.0	6.0	5.5	5.0	4.5	4.0

First estimate of density (unit weight) of fresh concrete

Maximum size of aggregate mm	First estimate of density of fresh concrete	
	Non air-entrained concrete	Air-entrained concrete
	kg/m ³	kg/m ³
10	2285	2190
12.5	2315	2235
20	2355	2280
25	2375	2315
40	2420	2355
50	2445	2375
70	2465	2400
150	2505	2435

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S.E. (Civil Engineering) (Semester - IV)
Examination, November - 2019
CONCRETE TECHNOLOGY
Sub. Code : 63346

Day and Date : Friday, 15 - 11 - 2019

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Assume suitable data if necessary.
 - 3) Figures to the right indicate full marks.

SECTION - I

- Q1) a) Enlist the physical properties of cement. Explain any ONE property in detail. [8]
b) Enlist the physical properties of aggregates. Explain any TWO properties. [8]

- Q2) a) Enlist the steps of manufacture of concrete. Explain any ONE in detail. [8]
b) Explain [8]
i) Segregation
ii) Bleeding

OR

- b) Enlist various admixtures used in concrete. Explain any TWO in detail. [8]
Q3) a) Explain 'modulus of elasticity of concrete' with sketch. [9]
b) Explain 'creep of concrete' in detail with sketch. [9]

SECTION - II

- Q4) Write notes on any THREE. [18]
a) Cold weather concreting
b) High strength concrete
c) Fiber reinforced concrete
d) Pavement quality concrete

- Q5) a) Why 'durability of concrete' is important? Explain the factors affecting durability. [8]
b) Enlist various non destructive tests on concrete. Explain any ONE with sketch. [8]

OR

- b) Explain different exposure conditions prescribed by IS: 456 - 2000. [8]



16) Design M 30 concrete using the following data as per ACI 211.1-91 method.[16]

- Grade designation : M 30 (non air entrained)
- Type of cement - O.P.C. 43 Grade
- Maximum size of available aggregate - 20 mm
- Workability - 100 mm slump
- Exposure condition - Exposed to fresh water
- Standard Deviation - 5 MPa
- Specific gravity of cement - 3.15
- Specific gravity of C.A. - 2.8
- Specific gravity of F.A. - 2.7
- Fineness modulus of F.A. - 2.8.
- Density of coarse aggregate - 1600 kg/m³
- Probability factor - 1.64

Dry Bulk Volume of Coarse Aggregate per Unit Volume of Concrete

Maximum Size of Aggregate (mm) ↓	Bulk volume of dry rodded coarse aggregate per unit volume of concrete for fineness modulus of sand of			
F.M. →	2.40	2.60	2.80	3.00
10	0.50	0.48	0.46	0.44
12.5	0.59	0.57	0.55	0.53
20	0.66	0.64	0.62	0.60
25	0.71	0.69	0.67	0.65
40	0.75	0.73	0.71	0.69
50	0.78	0.76	0.74	0.72
70	0.82	0.80	0.78	0.76
150	0.87	0.85	0.83	0.81

Relation between water / cement ratio and average compressive strength of concrete

Average compressive strength at 28 days MPa	Effective water / cement ratio (by mass)	
	Non-air entrained concrete	Air entrained concrete
45	0.38	-
40	0.43	-
35	0.48	0.40
30	0.55	0.46
25	0.62	0.53
20	0.70	0.61
15	0.80	0.71

Requirements of ACI 318-89 for W/C ratio and strength for special exposure Conditions.

Sr. No.	Exposure Condition	Maximum W/C ratio, normal density aggregate concrete	Minimum design strength, low density aggregate concrete MPa
I	Concrete intended to be watertight		
a)	Exposed to fresh water	0.50	25
b)	Exposed to brackish or sea water	0.45	30
I	Concrete exposed to freezing and thawing in a moist condition		
a)	Kerbs, gutters, guard rails or thin sections	0.45	30
b)	Other elements	0.50	25
c)	In presence of de-icing chemicals	0.45	30
II	For corrosion protection of reinforced concrete exposed to de-icing salts, brackish water, sea water or spray from these sources	0.40	33

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Total No. of Pages : 3

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S.E. (Civil Engineering) (Semester - III) Examination, November - 2019

ENGINEERING MATHEMATICS - III

Sub. Code: 63338

Day and Date : Saturday, 23 - 11 - 2019

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Use of non programmable calculator is allowed.

SECTION - I

Q1) Attempt any three of the following.

[18]

- a) Solve $(D^4 - 1)y = \cos x \cosh x$
- b) Solve $(D^2 + 5D + 4)y = x^2 + 7x + 9$
- c) Solve $(D^2 + 1)y = \operatorname{cosec} x$
- d) The deflection of a strut of length l with one end ($x = 0$) built in and the other supported and subjected to end thrust P , satisfies the differential

equation $\frac{d^2 y}{dx^2} + a^2 y = \frac{a^2 R(l-x)}{P}$, where $a^2 = \frac{P}{EI}$. Find the equation of the deflection curve.

Q2) Attempt any two:

[16]

- a) Find the constants a and b if the directional derivative of $\phi = ay^2 + 2bxy + xz$ at $P(1, 2, -1)$ is maximum in the direction of the tangent to the curve $\vec{r} = (t^3 - 1)\vec{i} + (3t - 1)\vec{j} + (t^2 - 1)\vec{k}$ at point $(0, 2, 0)$.
- b) Show that the vector field represented by $\vec{F} = (y^2 - z^2 + 3yz - 2x)\vec{i} + (3xz + 2xy)\vec{j} + (3xy - 2xz + 2z)\vec{k}$ is both irrotational and solenoidal. Also obtain its scalar potential.
- c) Find the magnitude of tangential component of acceleration at any time t of a particle whose position at any time t is given by $x = \cos t + t \sin t$, $y = \sin t - t \cos t$.



Q3) Attempt any two:

- a) Fit a second degree parabola
- $y = ax^2 + bx + c$
- to the following data:

x	10	12	15	23	20
y	14	17	23	25	21

- b) Fit the curve
- $y = ab^x$
- to the following data:

x	1	2	3	4	5	6	7	8
y	1	1.2	1.8	2.5	3.6	4.7	6.6	9.1

- c) Find the two lines of regression for the following data:

x	19	22	24	27	29	33	37
y	10	12	13	16	17	20	25

SECTION - II

Q4) Attempt any two of the following.

[16]

- a) 10% of the tools produced in a certain manufacturing process turn out to be defective. Find the probability that :
- In a sample of 10 tools chosen at random exactly two will be defective.
 - Out of 20 tools selected at random there are exactly two defectives and at least two defectives.
- b) In a certain factory producing cycle tyres there is a small chance of 1 in 500 for any tyre to be defective. The tyres are supplied in lots of 10. Using Poisson distribution calculate the approximate number of lots containing no defective, one defective & two defective tyres respectively in a consignment of 20000 tyres.
- c) The life time of certain type of battery has mean life of 400 hours & a standard deviation of 50 hours. Assuming the distribution of life time to be normal, find:
- The percentage of batteries which have life time more than 350 hours.
 - The percentage of batteries which have life time between 300 & 500 hours. (Given : For S.N.V. z area between $z = 0$ & $z = 1$ is 0.3413 and $z = 0$ & $z = 2$ is 0.4772).

Q5) Attempt any three of the following.

- a) Using Laplace transformation evaluate $\int_0^\infty e^{-2t} t \sin^2 t \, dt$.
- b) Find the Laplace transform of $\frac{2 \sin t \sin 2t}{t}$.
- c) Obtain the inverse Laplace transform of $s^2 / (s^2 + 4)^2$ using convolution theorem.
- d) Use Laplace transform to solve $(D^2 + 4D + 8)y = 1$ where $y(0) = 0$, $y'(0) = 1$.

Q6) Attempt any two of the following.

[16]

- a) Evaluate $\int_0^{1+i} z^2 dz$ along the path
- $y = x$
 - $x = y^2$
- b) Show that $u = y^3 - 3x^2 y$ is a harmonic function and find its harmonic conjugate and corresponding analytic function.
- c) If $f(z) = u + iv$ is an analytic function of $z = x + iy$ & $u - v = e^x (\cos y - \sin y)$, find $f(z)$ in terms of z .

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Total No. of Pages :3

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S.E. (Civil) (Semester - IV) (Revised)
Examination, November - 2019
FLUID MECHANICS - II
Sub. Code :63347

Day and Date :Tuesday, 19-11-2019
Time : 2.30 p.m.to 5.30 p.m.

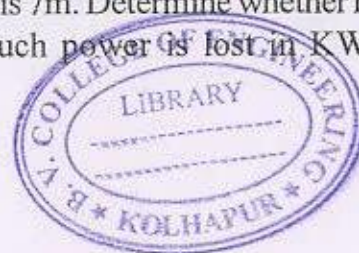
Total Marks :100

- Instruction :**
- 1) Attempt any three questions form each section.
 - 2) Figures to the right indicate full marks.

SECTION-I

- Q1) a)** Derive the resistance equations for open channel flow. what are the factors affecting rugosity coefficient. [8]
- b)** Find the dimensions of most economical rectangular & trapezoidal channel section to carry discharge of 5 cumec, bed slope 1 in 3600 & $n=0.02$. [8]
- Q2) a)** Derive Dynamic equation of GVF & give the assumptions. Mention all the forms of equation. [8]
- b)** A wide rectangular channel carries a discharge of $5\text{ m}^3/\text{s}$ per unit width of channel. The bed slope is 1 in 3600 & $n=0.02$. If the channel ends in a drop, determine how for u/s the depth of flow would be 10% less than normal depth? Use direct step method, taking 2 steps. Take starting depth as critical depth. Draw sketch and classify the flow. [8]
- Q3) a)** What is hydraulic jump? Explain with sketch. A sluice gate discharges water into a horizontal rectangular channel with velocity of 5 m/s and depth of flow 0.35m. width of channel is 7m. Determine whether hydraulic jump will occur. If so find how much power is lost in KW and all parameters of jump [8]

P.T.O.



SC-20

- b) Define spatially varied flow (SVF). What are the practical examples of SVF. State the dynamic equation of SVF with decreasing and increasing discharge. Draw illustrative sketches. [8]

Q4) Write Short notes on (any three) [18]

- M1, S2, H3 type of GVF profiles
- Velocity distribution in open channel flow
- Specific energy curve, section factor curve
- Types and uses of hydraulic jump
- Side weir

SECTION-II

- Q5) a) Derive an expression for discharge over a rectangular notch considering end contraction and velocity of approach. Comment on coefficient of discharge. [8]

- b) Derive the formula to empty the reservoir by rectangular weir uniform c/s area of 0.1 km^2 & is provided with a rectangular weir 5m long. How long will it take for water level to fall from 60cm to 30cm? Take $C_d = 0.623$. [8]

- Q6) a) A 75mm diameter jet having a velocity of 3m/s strikes a flat plate inclined at 45° . Find the normal force acting on the plate. [8]

- When the plate is stationary
- when the plate is moving with velocity of 15m/s and away from the jet
- Determine power & efficiency.

- b) show that theoretical efficiency of a water wheel having equispaced symmetrical semicircular curved vanes fixed radially can be as maximum as 100% when the jet of water strikes the vane normally at their centers. Why is this efficiency never achieved in actual practice? [8]

SC-20

- Q7) a) Draw a neat sketch of Francis turbine & explain the working of each component part. [8]

- b) Draw a schematic sketch of centrifugal pump. Name its part. [4]

- c) A centrifugal pump is delivering $0.04 \text{ m}^3/\text{s}$ against total static head of 20m through a 150mm diameter & 100m long delivery pipe. If the inlet losses in suction pipe are equal to 0.33m & coefficient of friction in delivery pipe is 0.06 Consider exit loss of pipe. Find the power require Assume overall efficiency of the pump as 70%. [4]

Q8) Write short notes on (any three) [18]

- Broad crested weir & Round crested weir
- Selection of type of turbine.
- Performance characteristics curves for centrifugal pump
- Cavitation in pump & turbines
- Specific speed of turbine.



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Total No. of Pages : 3

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S.Y. B. Tech. (Civil) (Semester - III) (CBCS)
Examination, November - 2019
ENGINEERING MATHEMATICS - III
Sub. Code : 73197

Day and Date : Saturday, 23 - 11 - 2019

Total Marks : 70

Time : 10.00 a.m. to 12.30 p.m.

- Instructions :
- 1) Attempt any three questions from each section.
 - 2) Figure to the right indicate full marks.
 - 3) Use of non-programmable calculator is allowed.

SECTION - I

Q1) a) Solve $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4y = e^{2x}$. [6]

b) Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2$. [6]

Q2) a) Find the angle between the normals to the surfaces $x^2y + 2xz = 4$ at $(2, -2, 3)$ and to $x^3 + y^3 + 3xyz = 3$ at $(1, 2, -1)$. [6]

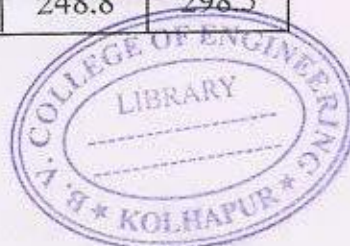
b) Prove that the vector $\vec{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is solenoidal and determine the constants a, b, c if \vec{F} is irrotational. [5]

Q3) a) Fit a straight line to the following data [5]

x	1	2	3	4	6	8
y	2.4	3	3.4	4	5	6

b) From the following data fit a curve $y = ab^x$ [6]

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5



P.T.O.

24) Attempt any TWO from the following

a) Solve $x^3 \frac{d^3 y}{dx^3} + 2x^2 \frac{d^2 y}{dx^2} + 2y = 10 \left(x + \frac{1}{x} \right)$. [6]

b) Prove that $\nabla \cdot \left(\frac{\vec{r}}{r^3} \right) = 0$. [6]

c) Find the equation of line of regression of y on x for the following data:

x	80	45	55	56	58	60	65	68	70	75	85
y	82	56	50	48	60	62	64	65	70	74	90

[6]

SECTION - II

Q5)a) If in a lot of 500 solenoids 60 are defective, find the probability that there will be 0, 1, 2 defective solenoids in a random sample of 20 solenoids.

[6]

b) Fit a Poisson distribution to the following data

[6]

x =	0	1	2	3	4
y =	112	63	20	4	1

26) a) Find the Laplace transform of $e^{-4t} \int_0^t u \sin 3u \, du$

[6]

b) Obtain $L^{-1} \left[\frac{2s+3}{s^3+6s^2+11s+6} \right]$ [5]

27) a) Apply Simpson's $\frac{1}{3}$ rule to find the value of $\int_0^1 \frac{dx}{1+e^{-x}}$ dividing the range into 10 equal parts. [6]

b) Evaluate $\int_{-3}^3 x^4 \, dx$ by Trapezoidal rule using 12 intervals and compare with exact value. [5]

28) Attempt any TWO of the following

[12]

a) The income distribution of a group of 10000 persons was found to be normal with mean Rs. 750 and standard deviation Rs. 50. What percentage of this group had income i) exceeding Rs. 668 ii) exceeding Rs. 832? (Given : Area under standard normal curve between ordinates at ± 1.64 is 0.899)

b) Using convolution theorem find the inverse Laplace transform of $\frac{1}{s(s^2+4)}$

c) Evaluate $\int_0^{\pi/2} \frac{\sin x}{x} \, dx$ by Trapezoidal rule using 9 intervals.

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