Code No. 430 / CBCS

FACULTY OF ENGINEERING

B.E. (Civil) III – Semester (CBCS) (Main) Examination, December 2017

Subject: Surveying – I

Time: 3 Hours **Max.Marks : 70**

Note: Answer all questions from Part A and any five questions from Part B.

PART – A (10x2 = 20 Marks)

1 State the principles of chain surveying. (2)

2 What is Hypotenusal Allowance? (1)

3 Who are the leader and follower when a line is being chained? (2)

4 Write about Dip of magnetic needle. (2)

5 What is Sensitiveness of the bubble? (2)

6 What are the advantages of plane table surveying? (2)

7 What do you mean by line of collimation? (2)

8 Define the terms: contours, contour gradient and contour interval. (2)

9 List the three characteristics of Contour lines with neat sketches. (2)

10 Calculate the volume of earthwork in an embankment for which the crossectional areas at 20 m interval are as follows: Use a) End Area Formula b) Prismoidal Formula. (3)

Distance	0	20	40	60	80	100	120
Crossectional area(m^2)	42	64	72	16	18	26	11

PART – B (10x5 = 50 Marks)

11 a) What is a Well Conditioned Triangle? Why it is necessary to use well conditioned triangle? (3)

b) A nominal distance of 30 meters was set out with a 30 meter steel tape from a mark on the top of one peg to a mark on the top of the another, the tape being in catenary under a pull of 10 kg and at a mean temperature of 70° F. Calculate the horizontal distance between the marks on the two pegs and reduce it to mean sea level. Take radius of earth = 6370 km, density of tape = 7.86g/cm^3, section of tape = 0.08cm^2, coefficient of expansion = 6x10^{-6} per 1° F, Young's modulus = 2x10^6 kg/cm^2. (7)

12 a) Differentiate between the following:
i) Quadrental bearing and Whole circle bearing.
ii) Isogonic lines and agonic lines.
iii) Magnetic and true meridian. (5)

b) The following are the bearings observed in traversing, with a compass, of an area where local attraction was suspected. Calculate the interior angles of the traverse and correct them. (5)

Line	Fore bearing	Back bearing
AB	150°0’	330°0’
BC	230°30’	48°0’
CD	306°15’	127°45’
DE	298°0’	120°0’
EA	49°30’	229°30’

13. What is Two – point problem? (10)

14 a) Explain the procedure of reciprocal levelling including its principle. (5)

b) The following staff readings were recorded in levelling operation 1.185, 2.605, 1.925, 2.305, 1.155, 0.864, 1.105, 1.685, 1.215, 1.545 and 0.605.A is the B.M of R.L185.685m. Find the R.L’s of the other points by H.I method. The first reading was taken at point A and the instrument was shifted after the readings 2.604, 0.864 and 1.215. (5)

15 a) Distinguish between Trapezoidal rule and Simpson’s rule. (3)

b) Determine the area in hectares between the line AB and offsets taken at a regular interval of 20M long. Using Simpon’s and Trapezoidal rule.

Point	A								
Distance(m)	0	20	40	60	80	100	120	140	160
Offset length (m)	23	40	42	30	32	60	10	14	22

16 a) Describe the method of intersection in plane table survey. (3)

b) A chain line AB is obtained by a big pond and the points A and B are on the either side of pond. At ‘A’ a line CAD was ranged out. The distances AD = 320m, AC = 280 m, DB = 530 m, CD = 485 m are measured. Find the distance of AB. (7)

17 Write in short note on: (10)

a) Types of chains used in Surveying.
b) Differentiate between Prismatic and Surveyor’s Compass.
c) Temporary adjustments of Dumpy Level.

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Code No. 431/CBCS

FACULTY OF ENGINEERING

B.E (EE / Inst.) III – Semester (CBCS) (Main) Examination, December, 2017

Subject :Electronic Engineering - II

Time : 3 Hours **Max Marks : 70**

Note: Answer all questions from Part – A & Any five questions from Part – B.

Part – A (20 MARKS)

1. What is the effect of cascading of amplifiers on gain and bandwidth. (2)
2. Explain why gain of an amplifier falls at low and high frequency regions than at midfrequency. (2)
3. The input and output impedances of an amplifier are 1KΩ and 5KΩ respectively, Gain=100, feedback ratio =0.04.Calculate the input and output impedances of a current series feedback amplifier. (2)
4. Explain the feedback concept with a block diagram. (2)
5. What is frequency stability of an oscillator? (2)
6. Find the operating frequency of a Hartley oscillator if L1=50 mH,L2=30mH and C=10uF. (2)
7. Define efficiency, distortion and power dissipation in power amplifiers. (2)
8. Classify power amplifiers based on biasing condition. (2)
9. Draw integrating circuit using side? (2)
10. Define %tilt of differentiator? (2)

PART – B (50 Marks)

11. (a) Draw the circuit of a stage RC coupled FET amplifier. Draw its gain vs frequency characteristics and indicate cutoff frequencies and band width. (6)

(b) The three amplifier stages are cascaded to provide an overall gain of 10000.The first two stages have a gain of 40 dB and 26 dB .Determine the gain of the last stage in numerical values as well as in terms of dB. (4)

12. (a) Draw the Current shunt feedback amplifier Circuit diagram and derive expressions for A_{If} , R_{if} ,and R_{of},. (7)

(b) Compare types of feedback amplifiers in terms of different parameters. (3)

13. Draw and explain RC phase shift oscillator using BTT and derive its frequency of oscillations. (10)

14. (a) Draw the circuit of Complementary Symmetry Power Amplifier and explain its working. (6)

(b) In a class A power amplifier $V_{CE\ Max}$=20 V and $V_{CE\ Min}$ = 1 V. Find overall efficiency for (i) Series fed load (ii) Transformer coupled load. (4)

15. (a) Draw and explain the response of RC high pass circuit for a square wave input. (5)
    (b) What is a Clamper? Explain a negative peak clamper circuit. (5)

16. (a) Derive an expression for lower cutoff frequency of a low pass circuit and obtain Pulse response (6)
    (b) Write about stability of feedback amplifiers. (4)

17. Write short notes on the following. (10)
    (a) Coupling methods in amplifiers

    (b) Crystal Oscillator

    (c) Harmonic distortion in power amplifiers

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Code No. 438/CBCS

FACULTY OF ENGINEERING

B.E. III – Semester (ECE)(CBCS)(Main) Examination, December 2017
Subject: Elements of Mechanical Engineering

Time: 3 Hours **Max. Marks: 70**

Note: Answer all questions from Part A and any five questions from Part B.

PART-A (20 Marks)

1. Define heat engine, refrigerator and heat pump.
2. Identify the following as open system/closed system/isolated system. From below choices.

A) Computer B) Compressor C) Centrifugal pump D) Condenser in refrigerator.

3. Draw the neat sketch of a two stroke engine and label the parts.
4. What is the effect of clearance volume on the work done of a compressor?
5. Define effectiveness and LMTD of heat exchanger.
6. List different modes of heat transfer and mention one example in each case.
7. What are the applications of bevel gears and helical gears?
8. Define creep and slip of a belt drive.
9. Sketch EBM and label the parts.
10. Compare sand casting and die casting.

PART-A (50 Marks)

(Answer any five questions)

11 a) Simplify the steady flow energy equation for the following

i) Evaporator ii) Boiler iii) Steam turbine. 6

b) The relationship between pressure and volume in a non flow process is given as P+3} where P is in bar and volume is in m^3. During the process 1800kJ of heat is added to the gas and the volume changes from 1.5m^3 to 4m^3. Find change in internal energy. 4

12 a) Derive the expression for the work done per kg of air in a reciprocating air compressor with clearance volume. 5

b) A four cylinder four stroke petrol engine develops 15.5kW while running at 1200rpm. The mean effective pressure as estimated from indicator diagram is 6bar. Determine bore and stroke of the engine if the stroke length =1.5 times bore. 5

13 a) Derive an expression for the LMTD of counter flow heat exchanger and state the assumptions 4

b) A concrete wall of a house is 35cm thick has a surface area 12m X4.5m the inside temperature of the wall is 20^0C and outside temperature of the wall is 45^0C. Thermal conductivity of the concrete wall is 0.85W/m K. Determine the heat transfer through the wall and its thermal resistance. 6

14 a) Describe the working of compound gear train with a sketch and mention its applications. 4

b) A flat belt 10 mm thick and 110 mm wide transmits power rotating at 1500rpm. The mass of the belt is 095kg/m length. The angle of lap on the smaller pulley is 170^0.and coefficient of friction=0.25. The maximum permissible stress in the belt may be taken as $2.2N/m^2$. Determine i) Maximum power transmitted by the drive
ii) Initial tension in the drive iii) Ratio of tensions on two sides of the drive. 6

15 a) Describe the working of Arc welding process with a sketch and mention its engineering applications. 5

b) Explain various Rolling operations carried out in a steel industry with simple sketches. 5

16 a) Describe the working of four stroke petrol engine with sketches. 5

b) Write the classification and applications of heat exchangers. 5

17 a) Derive the expression for the length of a cross belt. 5

b) Describe the working of WJM with a neat sketch. 5

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Code No. 443/CBCS

FACULTY OF ENGINEERING

B.E (M/P/AE) III Semester (CBCS) (Main) Examination December 2017

Subject: Mechanics of Materials

Time: 3 Hours **Max. Marks: 70**

Note: Answer all questions from Part A and any five questions from Part B

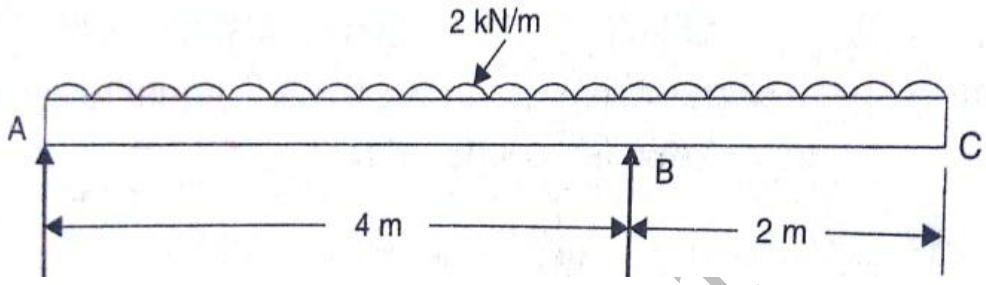
PART – A (20 Marks)

1. Define stress and what are the various types of stresses explain clearly with neat sketch. [2]
2. Find the minimum diameter of a steel wire, which is used to raise a load of 4KN if the stress in the rod is not to exceed 95MN/mm^2 [2]
3. What are the various types of possible loads acting on a beam explain clearly with neat sketch. [2]
4. Define Point of contraflexure [2]
5. What are the assumptions made in the theory of simple bending. [2]
6. A cantilever of length 2m fails a load of 2KN is applied at the free end. If the section of the beam is 40mmX60mm, find the stress at the failure. [2]
7. What do you mean by slope and deflection explain with neat sketch. [2]
8. A steel rod is 2m long and 50mm in diameter. An axial pull of 100KN is suddenly applied to the rod. Calculate the stress induced in the material and also calculate elongation produced in the rod. Take E=200GN/m^2. [2]
9. Define helical spring. Name the two important types of helical springs. [2]
10. A solid shaft of 20cm diameter is used to transmit torque. Find the maximum torque transmitted by the shaft if the maximum shear stress induced in the shaft is 50N/mm^2. [2]

PART – B (5 x10 = 50 Marks)

11. A steel tube of 30mm external diameter and 25mm internal diameter encloses a gun metal rod of 20mm diameter to which it is rigidly joined at each end. The temperature of the whole assembly is raised to 140^{0}C and the nuts on the rod are then screwed lightly home on the ends of the tube. Find the intensity of stress in the rod when the common temperature has fallen to 30^{0}C. The value of E for steel and gun metal is 2.1 X 10^{5}N/mm^2 and 1 X 10^{5}N/mm^2 respectively. The co-efficient of linear expansion for steel and gun metal is 12 X 10^{-6} per ^{0}C and 20 X 10^{-6} per ^{0}C [10]

12. Draw the shear force and bending moment diagrams for the over-hanging beam carrying uniformly distributed load of 2KN/m over the entire length as shown in below figure. And also locate the point of contra flexure. [10]



13. A rectangular beam 100mm wide and 250mm deep is subjected to a maximum shear force of 50KN. Determine a) Average shear stress b) maximum shear stress c) shear stress at a distance of 25mm above the neutral axis. And also draw shear stress distribution diagram. [10]

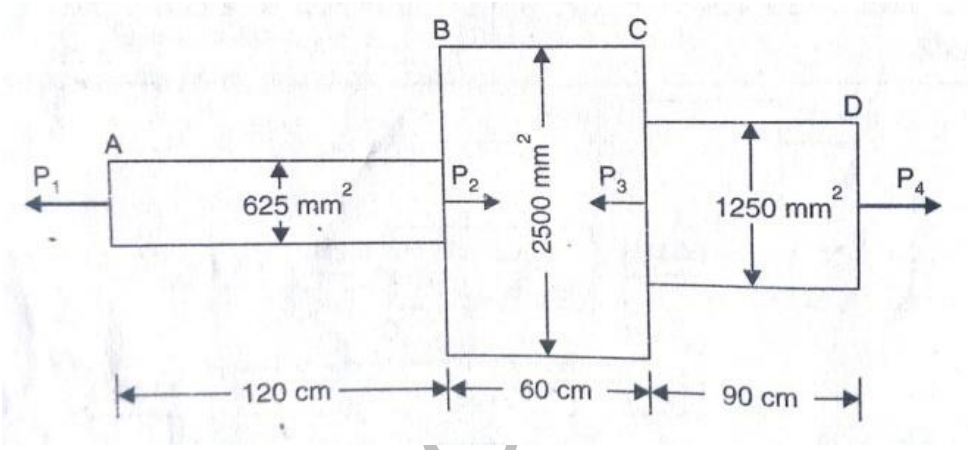
14. a) A beam 6m long, simply supported at its ends, is carrying a point load of 50KN at its centre. The moment of inertia of the beam is 78 X 10^6 mm^4. If young's modulus is 2.1 X 10^5 N/mm2, calculate deflection at the centre of the beam and slope at the supports. [5]

b) A beam 4m long, simply supported at its ends, carries a point load W at its centre. If the slope at the ends of the beam is not to exceed 1^0, find the deflection at the centre of the beam. [5]

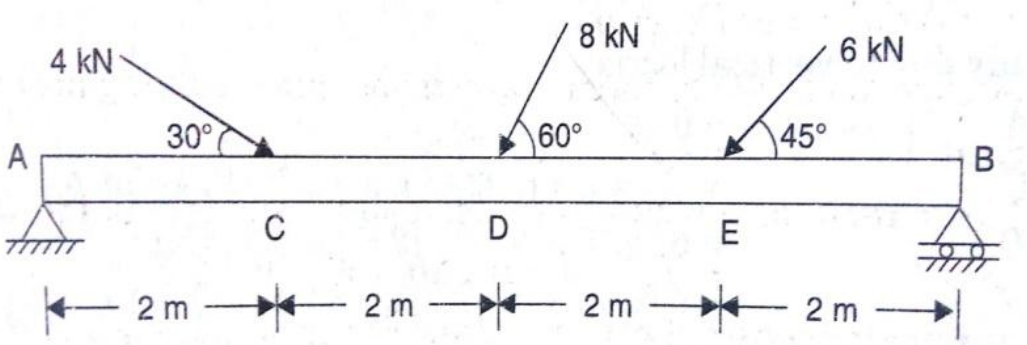
15. a)A laminated spring 1m long is made up of plates each 5cm wide and 1cm thick. If the bending stress in the plate is limited to 100 N/mm2, how many plates would be require to enable the spring to carry a central point load of 2KN. If E= 2.1x10^5 N/mm^2, what is the deflection under this load. [5]

b) Determine the diameter of a solid steel shaft which will transmit 90KW at 160r.p.m Also determine the length of the shaft if the twist must not exceed 1^0 over the entire length. The maximum shear stress is limited to 60 N/mm^2. Take the value of modulus of rigidity is 8 X 10^4 N/mm^2. [5]

16. A member ABCD is subjected to point loads P_1,P_2,P_3 and P_4 as shown in below figure Calculate the force P_2 necessary for equilibrium, if P_1 = 45KN, P_3 = 450KN and P_4 = 130KN. Determine the total elongation of the member, Take E= 2.1 X 10^5 N/mm^2. [10]



17. A horizontal beam AB of length 8m is hinged at A and placed on rollers at B. The beam carries three inclined point loads as shown in below figure Draw Shear force and bending Moment diagrams. [10]



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Code No. 451/CBCS

FACULTY OF ENGINEERING

B.E (CSE) III-Semester (CBCS) (Main) Examination, December, 2017

Subject : Basic Electronics

Time : 3 Hours **Max Marks : 70**

Note: Answer all questions from Part – A & Any five questions from Part – B.

Part - A (20 Marks)

1. What is meant by Fermi level? 2
2. Define drift current. 2
3. Derive relation ~ and . 2
4. Define drain resistance. 2
5. What are the advantages of negative feedback? 2
6. Why crystal oscillator are more stable? 2
7. Give the truth table of half – subtractor 2
8. What are universal gates? Why it is so called? 2
9. Draw the symbol of UJT. 2
10. What are the applications of CRO? 2

Part - B (50 Marks)

11. a) Write the difference between avalanche and zener breakdown. 4

    b) A half wave rectifier having a diode of resistance 1000Ω and a load of 1000Ω rectufies an ac voltage of $310V_{rms}$. Calculate 6

    (i) Peak, average and rms value of current (ii) dc Output power

    (iii) AC input power (iv) Efficiency

12. a) Explain construction and working of n-channel JFET

    b) Explain input and output characteristics of CB configuration. 5

13. a) Explain the working of Collpits oscillator. Derive its frequency. 5

    b) Derive input and output impedence of voltage series feedback. 5

14 a) Design the ckt which produces output $V_0 = 2\ V_1 - 3V_2 + 4V_3$ 5

    b) Design a full adder ckt using only NAND gates? 5

15 a) Explain Working of SCR. 5

    b) Explain construction and working of CRO. 5

16 a) Derive ripple factor of half wave rectifier with capacitor filter 7

    b) Derive relation between $\mu = g_m r_d$. 3

17. Discuss a) Strain gauge b) Instrumentation amplifier c) Crystal oscillator (3+4+3)

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Code No. 459/CBCS

FACULTY OF INFORMATICS

B.E. (I.T) (CBCS) III – Semester (Main) Examination, December 2017
Subject: Probability & Random Processes

Time: 3 Hours **Max. Marks: 70**

Note: (i) Answer All Questions from Part-A & Any five Questions From Part-B.

Part – A (20 Marks)

1 If $A \subset B$, $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$ determine $P(A|B)$.
2 State and prove total probability theorem
3 Determine the characteristic function of binomial distribution
4 An order of 3000 parts is received. The probability that a part is defective equals 10^3. Determine the probability P{k>5} that there will be more than five defective parts.
5 If two random variables X and Y are independent then prove that they are uncorrelated random variables.
6 Given $Z = X^2 + Y^2$. Determine the density f(z) of Z.
7 Write the conditions for a random process to be wide sense stationary.
8 Suppose that X(t) is a process with $\eta(t) = 3$, $R(t_1, t_2) = 9 + 4e^{-0.2|t_1 - t_2|}$. Determine the mean and variance of the random variable Z=X(5).
9 State Wiener-khintchine theorem.
10 Define white noise and determine R(τ) of white noise.

Part - B (50 Marks)

1. (a) State and prove Bernouli's theorem. (4M)
(b)Two players A and B draw balls one at a time alternately from a box containing m white balls and n black balls. Suppose the player who picks the first white ball wins the game. What is the probability that the player who starts the game will win? (6M)

2. (a) A discrete RV X has the following probability distribution (5M)

x	0	1	2	3	4	5	6	7	8
p(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

Find i) The value of 'a' ii. P(X<3) iii. P(2<X<6)

(b) Find the distribution and density functions of the random variable $Y=X^2$. (5M)

3. (a) Suppose X and Y are zero mean independent Gaussian random variables with common variance σ^2. Define $r = \sqrt{X^2 + Y^2}$, $\theta = \tan^{-1}\left(\frac{Y}{X}\right)$ where $|\theta| < \pi$
Obtain the joint density of r and θ . (6M)

(b) If the independent RVs X and Y have the variance 36 and 16 respectively, determine the correlation coefficient between U = X+Y and V=X-Y. (4M)

4. (a) If X(t) = sin(ωt+Y) , where Y is uniformly distributed in the interval (0,2Π). Prove that {X(t)} is a wide sense stationary process. (6M)

(b) State the properties of auto correlation function. (4M)

5. (a) The ACF of the random telegraph signal is given by $R(\tau) = a^2 e^{-2y|r|}$. Determine the power spectral density of the random telegraph signal process (5M)

(b) Suppose that the customers arrive at a bank according to a poisson process with a mean rate 3 per minute. Determine the probability that during a time interval of 2 mins

i) Exactly 4 customers arrive ii) More than 4 customers arrive (5M)

6. (a) Obtain the mean and variance of exponential distribution. (5M)

(b) Given $f_{xy}(x,y) = 1 \quad 0<|y|<x<1$

$= 0$ otherwise.

Determine E{X|Y} and E{Y|X} (5M)

7. (a) Over a period of 12 hours, 180 calls are made at random. What is the probability that in a four hour interval the number of calls is between 50 and 70. (5M)

(b) If the PSD of a WSS process is given by $S(\omega) = \frac{b}{a}(a - |\omega|), |\omega| \le a$ (5M)

$= 0 , |\omega| \ge a$

Find the auto correlation function of the process.

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Code No. 26

FACULTY OF ENGINEERING

B.E 2/4 (CE/EE/Inst/M/P/AE/CSE)I–Sem (Backlog) Examination, December, 2017

Subject : Mathematics – III

Time : 3 Hours **Max. Marks : 75**

Note: Answer all questions from Part – A & Any five questions from Part – B.

Part - A (25 Marks)

1. Eliminate the arbitrary functions f and g to obtain a partial differential equation from $z = f(x^2 - y) + g(x^2 + y)$. (3)
2. Solve $q(1+p) = pz$. (2)
3. Find the half range sine series of the function
$$f(x) = \begin{cases} x, & 0 < x < 2 \\ 2, & 2 \le x \le 4 \end{cases}$$ (3)
4. Solve $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$ (2)
5. Two dices are thrown. What is the probability that the sum on the faces of the two dice is greater than 8. (3)
6. Let X be a random variable with the following probability distribution (2)

x	0	1	2	3
P (X = x)	1/3	1/2	1/24	1/8

Then find E(x), E(x^2).

7. Six coins are tossed 1280 times. Find the probability of getting 6 heads 100 times using Poisson distribution. (3)
8. Find the moment generating function of ¡ ^{2} – distribution (2)
9. Show that the correlation coefficient is the geometric mean of the regression coefficients. (3)
10. Fit a straight line y = a + bx to the following data (2)

			3	
Y	-1	11	15	

Part - B (50 Marks)

11. a) Find a complete integral of the equation $2(z + xp + yq) = yp^2$ by using charpit's method. (5)

b) Solve $(x + 2z)p + (4xz - y) = 2x^2 + y$ (5)

12. Find the Fourier series for the function (10)

$$f(x) = \begin{cases} \prod x, & 0 \le x \le 1 \\ \prod(2-x), & 1 \le x \le 2 \end{cases}$$

And hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ... = \frac{\prod^2}{8}$

13. Solve $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$, $0 < x < l, t > 0$ Subject to $u(0,t) = u(l,t) = 0$: (10)

$u(x,0) = x(l-x)$, $\frac{\partial u}{\partial t}(x,0) = 0$.

14. a)State Baye's theorem.

b) A bag X contains 2 white and 3 red balls and another bag Y contains 4 white and 5 red balls. one ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from the bag Y. (3+7)

15. Let X be a variable which follows a normal distribution with mean 25 and standard deviation 6. Then find the following

(i) P(x < 28) (ii)P(x > 30) (iii) P(x < 20) (iv) P(| x – 25 | < 4)

(Given P (0 < Z < 0.5) = 0.19146 ; P (0< Z < 0.833) = 0.2961;

P (0< Z< 0.667) = 0.2454) (10)

16. A dice is thrown 102 times and the following distribution of faces is obtained

Face	1	2	3	4	5	6
Face frequency	15	25	16	20	12	14

Can we conclude that all faces are equally likely to occur? Test at 5% level of significance (Give χ^2_5 (0.05) = 11.07). (10)

17. a). Fit a curve y = a + bx + cx^2 to the following data (5)

X	-1	0	1	2	3	7
Y	9	7	7	9	13	49

b) Show that the correlation coefficient(r) is less than the arithmetic mean of the regression coefficients (where r > 0). (5)

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Code No. 40

FACULTY OF ENGINEERING

B.E. 2/4 (ECE) I – Semester (Backlog) Examination, December 2017

Subject: Applied Mathematics

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A and any five questions from Part B.

PART – A (25 Marks)

1 Form a partial differential equation by eliminating the arbitrary function f from $z = f(\sin x + \cos y)$. 2

2 Solve $p(1+q^2) = q(z-2)$. 3

3 Determine whether the function $f(z) = \sqrt{|xy|}$ is differentiable at origin. 2

4 If f(z) and $\overline{f(z)}$ are analytic, show that f(z) is constant. 3

5 Expand $f(z) = z \sin\left(\frac{1}{z+2}\right)$ in Laurent series about z = -2. 2

6 Find the image of the region |z| > 2 under the transformation $w = z^2$. 3

7 Construct the forward difference table for $y = x^3+2x+1$, x = 1, 2, 3, 4, 5. 2

8 Find the approximate value of y(0.2) for $y' = \frac{y-x}{y+x}$, y(0) = 1 by Euler's method. 3

9 Define correlation and regression. 2

10 Find the rank correlation coefficient for the data 3

x	1	2	3	4	5
y	5	4	3	2	1

PART – B (5x10 = 50 Marks)

11 a) Find the general solution of $(y-z)p+(x-y)q = z-x$. 5

b) Solve $q - px - p^2 = 0$ by Charpit's method. 5

12 a) Find the analytic function f(z) such that $Re[f'(z)] = 3x^2 - 4y - 3y^2$ and f(1+i) = 0. 5

b) Verify Cauchy's theorem for $f(z) = z^2$ taken over the boundary of a square with vertices at -1, 1, 1+i, -1 – i. 5

13 a) Find the Taylor's series expansion of $f(z) = \frac{2z^3+1}{z^2+z}$ about z = i. 5

b) State residue theorem and hence evaluate $\int_{-\infty}^{\infty} \frac{x\,dx}{(x^2+1)(x^2+2x+2)}$. 5

14 a) Use Newton-Raphson method to find a root of the equation $e^x - 4x = 0$ correct to three decimal places. 5

b) Compute $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x=1 from the following data. 5

x	1	2	3	4	5	6
y	1	8	27	64	125	216

15 a) Using the method of least squares, fit a curve of the form $y = ax^b$ for the following data: 5

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

b) Find the regression line of y on x for the following data: 5

x	1	2	3	4	5	8	10
y	9	8	10	12	14	16	15

16 a) Find a partial differential equation by eliminating arbitrary constants a, b from $z = a\, e^{-b^2 t} \cos bx$. 5

b) State Cauchy's integral formula and hence evaluate $\oint_C \frac{dz}{2-\bar{z}}$, where C is |z| = 1. 5

17 a) Determine the residues at the poles of $f(z) = \frac{z^2}{(z^2+3z+2)^2}$. 5

b) Two equations of regression lines are 8x – 10y + 66 = 0 and 40x – 8y – 214 = 0. Find average values of x and y and standard deviation of y. 5

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Code No. 56

FACULTY OF ENGINEERING

B.E. 2/4 (IT) I - Semester (Back Log) Examination, December 2017
Subject: Discrete Mathematics

Time: 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part A and any five questions from Part B.

PART-A (25 Marks)

1. Without using truth table, show that. $p \leftrightarrow qand(p \wedge q) \vee (\neg p \wedge \neg q)$ are logically equivalent 3
2. Express the statement "Every student in this class has studied calculus" using predicates and quantifiers. 3
3. Determine whether the function $f(x)=x^2$ from the set of integers to a set of integers is one-to-one. 2
4. Let $f(x)=x^3$, $g(x)=x^2+1$ for $x \in R$, find (gof)(x) and (fog)(x). 2
5. Find the prime factorization of 7007. 2
6. Find the coefficient of x^{16} in $(1+x^4+x8)^{10}$. 3
7. Find the value of $\sum_{k=50}^{100} k^2$ 3
8. State Pigeon hole principle. 2
9. Define Lexicographic ordering. 2
10. Differentiate between spanning tree and minimum spanning tree. 3

PART-B (50 MARKS)

11. a) Construct the truth table of the compound proposition 5

$(p \vee \neg q) \rightarrow (p \wedge q).$

b) Express the statement "Everyone has exactly one best friend" as a logical expression involving predicates, quantifiers with a universe of discourse consisting of all people and logical connectives. 5

12. a) Let U={1,2,3,4,5,6,7,8,9,10} and the ordering of elements of U has elements in increasing order i.e $a_i=i$. What bit strings represent the subset of all odd integers in U, the subset of all even integers in U and the subset of integers not exceeding 5 in U? 5

b) Write pseudo code for Insertion sort. Using this technique, arrange the elements of the list 3, 2, 4, 1, 5 in increasing order. 5

13. a) What are the solutions to the system of linear congruence 6

$$x \equiv 2 \pmod 3,$$
$$x \equiv 3 \pmod 5,$$
$$x \equiv 2 \pmod 7?$$

b) Identify how many positive integers between 100 and 999 inclusive
   i. divisible by 7?
   ii. divisible by 3 or 4? 4

14. a) Use Mathematical Induction to prove the formula for the sum of a finite number of terms of a geometric progression:

$$\sum_{j=0}^{n} ar^j = a + ar + ar^2 + \cdots + ar^n = \frac{ar^{n+1} - a}{r - 1} \qquad \text{when } r \neq 1,$$

where n is a nonnegative integer. 6

b) What is the coefficient of $x^{12} y^{13}$ in the expansion of $(x+y)^{25}$. 4

15. a) Find the solution to the recurrence relation $a_n=6a_{n-1}-11a_{n-2}+6a_{n-3}$, with initial conditions $a_0=2$, $a_1=5$, $a_2=15$. 5

b) Identify the generating functions for $(1 + x)^{-n}$ and $(1 – x)^{-n}$, where n is a positive integer, using the extended binomial theorem. 5

16. a) Draw the Hasse diagram for the partial ordering {(A, B) | A ⊆ B} on the power set P(S) where S = {a, b, c}.5

b) What is the prefix form for ((x + y) ↑ 2) + ((x − 4)/3)? 5

17. a) Explain Prim's algorithm to find a minimum spanning tree with an example. 5

b) Use the Quine –Mc Cluskey method to simplify the sum-of-products expansion. 5

$\mathbf{wxy\bar{z}} + \mathbf{w\bar{x}yz} + \mathbf{w\bar{x}y\bar{z}} + \mathbf{\bar{w}xyz} + \mathbf{\bar{w}x\bar{y}z} + \mathbf{\bar{w}\bar{x}yz} + \mathbf{\bar{w}\bar{x}\bar{y}z}.$

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