

# PURBANCHAL UNIVERSITY

**2019**

B.E. (Civil/Computer/E. & C.)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG395MS: Engineering Economics (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

**Answer FIVE questions.**

**5×16=80**

1(a) What are the different economics systems, explain. Differentiate between opportunity cost and sunk cost. 4.5 6

(b) Based on the following information, Calculate (a) total material cost variance, (b) total wage variance, (c) variable overhead variance, and (d) fixed overhead variance. 10

Particulars	Standard	Actual
Product (units)	900	750
Direct Material (Kg)	4000	4625
Direct Material Cost (Rs.)	120000	135000
Direct Labor (Hrs)	9000	7650
Direct Labor Cost (Rs.)	1100000	602500
Fixed Overhead (Rs.)	1000000	559625
Variable Overhead (Rs.)	630000	419750

2(a) Consider two alternatives X and Y. They have useful life of 3 and 4 years respectively. Their tabulated cash flow is shown below. MARR = 15% per year. Show which alternative is more desirable using repeatability assumption. 12

Activities	Alternatives	
	X	Y
Initial investments (Rs.)	4000	6000
Annual revenue (Rs.)	1500	2000
Annual Expenses	500	700
Salvage value (Rs.)	1000	1500

**Contd. ...**

(2)

- (b) What are the parameters for sensitivity analysis? Explain the steps for sensitivity analysis.

3(a) A city government is considering ~~two~~ types of town dump sanitary systems. Design A requires an initial outlay of \$400,000, with annual operating and maintenance cost of \$50,000 for the next 15 years; Design B calls for an investment of \$300,000, with annual operating and maintenance cost of \$80,000 per year for the next 15 years; Design C, which requires an initial outlay of \$350,000 and annual O&M cost of \$65,000 for 15 years. Fee collections from the residents would be \$85,000 per year. The interest rate is 8%, and no salvage value is associated with the either system. Using the benefit cost ratio (B/C); which system should be selected?

4

- (b) What are the drawbacks of IRR method? How does ERR method help to eliminate some of these drawbacks?

6

- 4(a) A man is planning to finance their 5 year old sons. Money can be deposited at 8% compounded quarterly. What quarterly deposit must be made from the son's 5th birthday to his 18th birthday to provide \$50,000 on each birthday from the 18th to the 23rd.

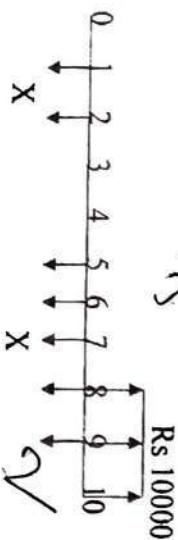
10

- (b) Define pay back period and minimum attractive rate of return. How does effective interest rate differ from nominal interest rate?

7.6

- 5(a) From the cash flow diagram, find the value of X that will establish the economic equivalence between the deposit series and the withdrawal series at an interest of 8%, compounded annually.

8



- (b) Two 100 HP motors are being considered for use. If power cost is \$0.10/Kw-hr. and interest rate is 12% per year, how many hours of operation per year are required to justify the purchase of Y brand motor? Which motor would you select if the motor is expected to operate 200 hrs per year.

Contd. ...

(3)

	X Brand	Y Brand
Purchase Price (\$)	1900	6200
Useful life. (year)	10	10
Annual maintenance expenses (\$)	170	310
Efficiency	80%	90%

4x4=16

6.

Write short notes on any FOUR:

- (a) Taxation system in Nepal ~~7~~  
 (b) Demand analysis ~~7~~  
 (c) Lifecycle Cost ~~1~~  
 (d) Single payment compound amount factor  
 (e) Depreciation ~~7~~  
~~7~~  
~~7~~

# PURBANCHAL UNIVERSITY

2019

B.E. (Computer) / Sixth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG377CO: Theory of Computation (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

**Answer EIGHT questions.**

1(a) Prove the following series by principle of induction:

$8^n - 3^n$  is divisible by 5, for  $n > 1$

5

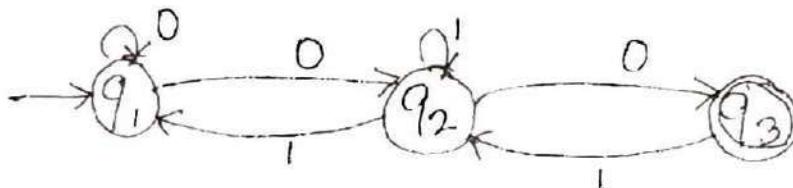
(b) Define DFA and NFA with suitable example. Design a DFA that accepts the language over  $\Sigma = \{a, b\}$  that has the set of all strings which contains the substring aba.

5

2(a) State and prove Arden's theorem.

3

(b) Convert finite qutomata given below to its corresponinding regular expression, using Arden's theorem.



Where,  $q_1$  is the initial state and  $q_3$  is the final state.

7

3. State and prove Pumping lemma for regular sets. Prove  $0^n 1^n$  is not regular.

5+5

4(a) Define ambiguous grammar and simple grammar with examples.

5

(b) Define derivation tree and Ambiguity of grammar with suitable example.

5

5. Discuss the moves of PDA. Design a PDA which accepts the given language  $L = \{WCW^R \text{ where } W \in \{a, b\}^*\}$ . Test whether the PDA you developed accepts the string aabcbaa.

2+6+2

Contd. ...

**(2)**

6. State Turing machine(TM) with block diagram and formal mathematical definition. Design a TM that accepts the language of all strings of even length. 3+7
7. State and prove the pumping lemma for context free language(CFL). Show that  $a^n b^n c^n$  is not CFL. 5+5
- 8(a) What is recursive and recursively enumerable language ? Mention it's properties. 5
- (b) What are intractable problems? Discuss. 5
9. Write short notes on any TWO:  $2 \times 5 = 10$
- (a) NP complete problem
- (b) Regular expression
- (c) Universal Turing machine



$$\begin{aligned}
 & \text{Left side: } 8^m \cdot 8^n \cdot 3^m \cdot 3^n \\
 & \text{Right side: } 8^{m+n} \cdot 8^m \cdot 3^{m+n} \cdot 3^m \cdot 3^n \\
 & \text{Equation: } 8^m \cdot 8^n \cdot 3^m \cdot 3^n = 8^{m+n} \cdot 8^m \cdot 3^{m+n} \cdot 3^m \cdot 3^n \\
 & \text{Simplifying: } 8^m \cdot 8^n \cdot 3^m \cdot 3^n = 8^{m+n} \cdot 8^m \cdot 3^{m+n} \cdot 3^m \cdot 3^n \\
 & \text{Final result: } 8^m \cdot 8^n \cdot 3^m \cdot 3^n = 8^{m+n} \cdot 8^m \cdot 3^{m+n} \cdot 3^m \cdot 3^n
 \end{aligned}$$

**PURBANCHAL UNIVERSITY**  
**2019**

B. E. (Computer) / Sixth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG376CO: Multimedia Computing & Technology (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Necessary Tables are may be used.*

**Answer EIGHT questions.**

- 1(a) Define multimedia and multimedia system with its properties. 3 4
- (b) Explain the different types of media with example. 4 5 6
- 2(a) Explain MIDI components and MIDI messages. 3 5 5
- (b) How the speech can be generated and analyzed? 3 5 5
3. Define image and graphics. Explain the image recognition with its steps. 2+8
- 4(a) Define animation. Explain animation language with example. 3 5
- (b) Explain the visual representation. 4 5
5. Explain data compression techniques with example. Explain the importance of compression technique. 6,5 7+3
- 6(a) Explain the steps of the JPEG compression process. 3 5
- (b) Describe CD-ROM with its limitations. 2,5 5
7. Describe the relation between hypertext and multimedia system. Explain document architecture of ODA. 6 4+6
8. Explain the requirements of resource management. Differentiate between EDF and Rate monotonic scheduling algorithm. 6,5 3+7
9. Write short notes on any TWO: 2×5=10
- (a) MM communication architecture.
- (b) Object-oriented approaches in multimedia system.
- (c) Role of MM in education sector.



# PURBANCHAL UNIVERSITY

**2019**

B. E. (Computer) / Sixth Semester / Final

Time: 01:30 hrs.

Full Marks: 40 / Pass Marks: 16

**BEG391MS: Project and Organization Management (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

## Group A

**Answer TWO questions.**

**2×8=16**

1. Explain the concept of project management and project environment. Discuss the social, economical, environmental impact of project.
2. Explain Project Implementation and Project Planning phase. Describe why project implementation phase is considered as the most important phase. **5**
3. Write at least five differences between PERT and CPM. Draw a Network diagram for the following: Find: A Critical path/Critical activities **8** **2+6**

B Minimum completion time of the Project

C Find ES, EF, LS, LF, and IF, FF and IF

Activities	Predecessors	Duration (Days)
A	None	2
B	None	3
C	None	4
D	A	5
E	D, B	6
F	C	7
G	B, E	8
H	F	9
I	G, H	10

## Group B

**Answer SIX questions.**

**6×4=24**

4. Differentiate between HRM and Personnel Management. Describe different functions of Personnel Management.

Contd. ...

5. Explain the concept of trade union. Discuss trade union movement in Nepal. 3
6. Explain different functions and roles of management. 3 5
7. Explain the characteristics of organization. 2 5
8. Define the concept of management. Explain Management by objectives. 3 5
9. Why is organization chart prepared in an organization? 2
10. Explain the necessity of industrial relationship.
11. Write short notes on any TWO: 2x2=4
- (a) -Project Proposal.
  - (b) Feasibility Study. | 5
  - (c) Role of Manager/Management 4 5



# PURBANCHAL UNIVERSITY

2019

B.E. (Computer)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG375CO: Computer Network (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

**Answer EIGHT questions.**

**$8 \times 10 = 80$**

- 1(a) Mention the important benefits of computer networks. 5
- (b) Differentiate between connection oriented and connectionless services in computer network. 5
- 2(a) Why do we use CSMA-CA instead of CSMA-CD? 5
- (b) Differentiate between twisted pair, coaxial cable and optical fiber of guided media. 5
3. What is RAID technology? Discuss the different levels of RAID in brief. 2+8
- 4(a) List the IEEE standard 802 for LANs. Explain any three. 5
- (b) Which layer of X.25 is called packet layer protocol? Explain virtual circuit of X.25. 5
5. What is congestion control in computer network? Differentiate between leaky bucket and token bucket algorithm. 4+6
6. Why error detection and correction is required in computer network? Explain how Checksum can be used for error detection with suitable example. 3+7
7. How TCP/IP differ from OSI model? Explain each layer in detail. 3+7
8. What is cryptography? Explain the concept of digital signature. 2+8
9. Write short note on any FOUR. 4×2.5=10
  - (a) TCP format
  - (b) Protocol Standards
  - (c) Network workstation
  - (d) APRET
  - (e) Firewall



**PURBANCHAL UNIVERSITY**  
**2019**

B. E. (Computer/Electronics & Comm.)/Sixth Semester/*Final*

Time: 03.00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG203SH: Probability & Statistics (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*Students are allowed the Statistical Table (Standard Normal Table, T distribution Table and Chi-square Table).*

**Answer EIGHT questions.**

**8×10=80**

- Q. 1(a) Prepare a brief note on application of statistics in Engineering.  
 (b) Following observation from two different cathode ray tubes that used air as the gas:

Tube I	0.57	0.34	0.43	0.32	0.48	0.40	0.40
Tube II	0.53	0.47	0.47	0.51	0.63	0.61	0.48

Which tube is more homogeneous and why

- Q. 2(a) Define Karl Pearson correlation coefficient and write down its basic properties.  
 (b) Find out the regression line of dependent variable Y on independent variable X for the following data. Also estimate the value of Y when the value of X is 65.

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

- Q. 3(a) State and prove the multiplicative theorem of probability.  
 (b) There are two machines in a factory. The probability of machine X works 24 hours without failure is 0.8 and the probability of machine Y working 24 hours without failure is 0.5. Find the probability that  
 (i) Both machines will work for 24 hours without failure.  
 (ii) Only one machine will work for 24 hours without failure.  
 (iii) None of the machine will work for 24 hours without failure.

- Q. 4(a) If a random variable X forms the following function.

X	3	2	1	0	-1	-2	-3
P(x)	0.1	0.2	3k	k	2k	0	0.1

Find the value of k. Also find the mean and variance of X.

(2)

- (b) The Probability density of a random variable  $X$  is given below as

$$f(x) = \begin{cases} kx^2, & 0 < x < 3 \\ 0, & \text{otherwise} \end{cases}$$

~~X~~

- (i) If  $f(x)$  is a probability density function find the value of constant  $K$

- (ii)  $P(1 < X < 2)$

- (iii) Find the distribution function of given density function.

- 5(a) Define the Poisson distribution. Discuss its properties.

- (b) If we inspect 10 items at random for a Binomial distribution and found that the following relation  $P(X = 2) = 3 P(X = 3)$

Find the probability that the random variable

- (i)  $P(X=0)$

- (ii)  $P(X=3)$

- (iii)  $P(X \leq 3)$

- (iv)  $P(X \geq 3)$

- 6(a) Define continuous random variable. Mention fundamental properties of normal distribution.

- (b) An Electrical engineer has found that the standard house hold light bulbs produced by a certain manufacturer have a useful life that is normal distributed with mean of 250 hours and a variance of 2500. what is the probability that a randomly selected bulb from this production process will have a useful life.

- (i) In excess of 300 hours

- (ii) Between 190 and 270 hours

- (iii) Not exceeding 200 hours.

- 7(a) Define Standard error of estimation. Differentiate between parameter and statistic.

- (b) A reading test is given to an elementary school class that consists of 12 boys and 10 girls. The results of the test are as follows:

Boys	Girls
Mean	74
S. D.	8

~~X~~~~S~~~~X~~~~S~~~~D~~~~S~~

Find the 95% Confidence limits of difference of mean.

(3)

- 8(a) Write down the general steps of test of significance of difference of proportion of success.

~~X~~

- (b) The breaking strength of cable produced by a manufacturer have a mean of 1800 pounds and standard deviation of 100 lbs. by a new technique in the manufacturing process, it is claimed that the breaking strength can be increased. To test this claim, a sample of 50 cables is tested and it is found that the mean breaking strength is 1850 lbs. can we support the claim at the 0.01 level of significance.

- 9(a) Write down the steps of paired t-test.

~~X~~

- (b) A time study engineer developed a new sequence of operation elements that he hopes will reduce the mean cycle time of a certain production process. The results of a time study of 20 cycles are given below: Cycle time in minutes.

12.25, 11.97, 12.15, 12.08, 12.31, 12.28, 11.94, 11.89, 12.16, 12.04,

12.09, 12.15, 12.14, 12.47, 11.98, 12.04, 12.11, 12.25, 12.15, 12.34,

If the present mean cycle time is 12.5 minutes, Should he adopt the new sequence at 1% level of significance?

- 10(a) The theory predicts the proportion of beans, in the four groups A, B, C, and D 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? Test at 5% level of significance.

(i) In excess of 300 hours

(ii) Between 190 and 270 hours

(iii) Not exceeding 200 hours.

- (b) The following is the distribution of the hourly number of truck arriving at a company's warehouse. Fit the Poisson distribution and test the goodness of fit at 5% level of significance.

Trucks arriving per hour	Frequency
0	52
1	151
2	130
3	102
4	45
5	12
6	5
7	1
8	2

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**2018**

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**BEG375CO: Computer Network (New Course)**

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**Answer EIGHT questions.**

- |  |                   |
|--|-------------------|
| 1(a) Mention the important benefits of computer networks.  | 5                 |
| (b) Briefly explain each layer of OSI model.   | 5                 |
| 2(a) Briefly explain with suitable example of CSMA/CD protocol.                                  | 5                 |
| (b) Explain RAID in detail.  | 5                 |
| 3(a) What are the three major classes of guided media? Briefly explain them.                     | 5                 |
| (b) Describe and distinguish between FDMA and TDMA.  | 5                 |
| 4(a) What is an Ethernet address? Explain IEEE802.3 and the Ethernet.                            | 1+4               |
| (b) What are the drawbacks in 802.3 which are overcome in 802.4?                                 | 5                 |
| 5. Explain leaky-bucket and token bucket algorithms.   | 5+5               |
| 6(a) Briefly explain TCP/IP protocol architecture.   | 5                 |
| (b) Differentiate between IPv4 and IPv6.   | 5                 |
| 7. What is non-adaptive routing algorithm? Explain various types of adaptive routing algorithms? | 2+8               |
| 8(a) What is protocol? Classify IP address on the basis of classes and version.                  | 5                 |
| (b) What is ICMP protocol? Explain types of error generated by ICMP.                             | 1+4               |
| 9. Write short note on any TWO.  | $2 \times 5 = 10$ |
| (a) Domain model      (b) Bridge      (c) Aloha  | ≡                 |

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*Candidates are required to give their answers in their own words as far as practicable.*

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**Answer FIVE questions.**

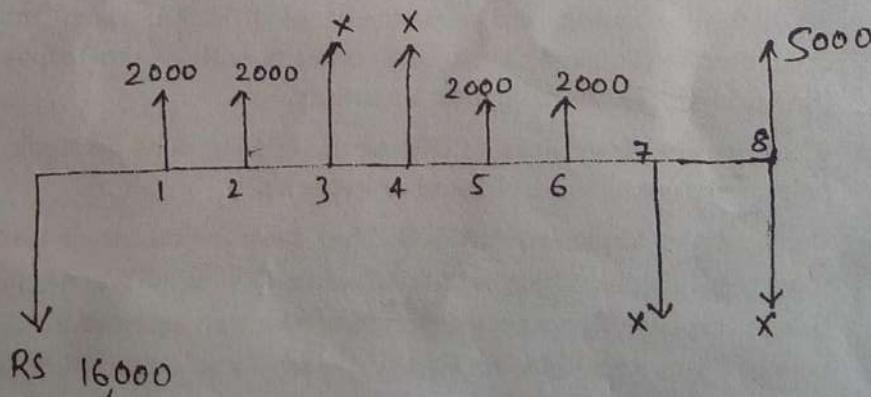
**$5 \times 16 = 80$**

1(a) Explain the principles of Engineering Economics. 4

(b) Based on the following information, Calculate (a) total material cost variance, total wage variance. (c) variable overhead variance, and (d) fixed overhead variance. 12

Particulars	Standard	Actual
Product (units)	11,000	8,000
Direct Material (Kg)	55,000	61,250
Direct Material Cost (Rs.)	13,50,000	14,50,250
Direct Labor (Hrs)	1,00,500	68,250
Direct Labor Cost (Rs.)	1,27,50,000	85,25,000
Fixed Overhead (Rs.)	12,70,000	88,75,125
Variable Overhead (Rs.)	83,00,000	57,90,250

2(a) The following cash flow diagram has an internal rate of return of 20%. Compute the unknown value of x. 8



**Contd. ...**

**(2)**

(b) Perform sensitivity analysis by investigating the annual worth of

- (i) Initial investment
- (ii) Annual net revenue.

Initial investment	: Rs. 6,00,000
Annual revenue	: Rs. 1,10,000
Annual expenses	: Rs. 10,000
Salvage value	: Rs. 8000
Useful life	: 15 years
MARR	: 10%

Also draw the Sensitivity Graph.

8

3(a) A government agency is considering four independent projects, each having 30 years projected useful lives. The nominal interest rate is 10% per year. Using the B/C ratio method, which of the projects shown below should be selected. Use any of OPW, FW or AW method.

Project	Initial Investment (\$)	Annual Cost (\$)	Annual Benefits (\$)
A	12000	1250	3250
B	20000	4500	8000
C	10000	750	1250
D	14000	1850	4050

(b) Explain the time value of money?

4

4(a) A buildings priced at 1,00,00,000. If a down payment of 30,00,000 is made and a payment of 1,00,000 every month thereafter is required, how many months will it take to pay for the building?  $i=12\%$  compound monthly.

10

(b) What are the drawbacks of IRR method? How does EIRR method help to eliminate some of these drawbacks.

6

5(a) Consider two alternatives A & B. They have useful life of 4 and 8 year respectively. Their tabulated cash flow is shown in figure below. Suppose the expected period of required services for X & Y is only 8 years and MARR=10% per year. Show which alternative is more desirable based on the co-terminated assumptions.

12

**(3)**

Investment	Rs. 350000	Rs. 500000
Annual Revenues	Rs. 190000	Rs. 250000
Annual Cost	Rs. 64500	Rs. 138500
Useful Life	4 years	8 years
Salvage Value	Rs. 10000	Rs. 15000

(b) What is a Decision Tree? Discuss its application in risk analysis. 4

6. Write short notes on any FOUR.

4x4=16

- (a) Elements of cost
- (b) Market Research Techniques
- (c) Depreciation
- (d) VAT
- (e) Uniform series present worth factor.

22

Contd. ...

**PURBANCHAL UNIVERSITY**

**2018**

B. E. (Computer)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG376CO: Multimedia Computing & Technology (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

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**Answer EIGHT questions.**

- 1(a) Define multimedia system. What are the characteristics of multimedia system. 2+3
- (b) Explain different modes of data transmission in brief. 5
- 2(a) Explain MIDI hardware and list MIDI software along with brief description. 5+2
- (b) What are the techniques for speech transmission? 3
- 3(a) Explain the framework of interactive graphics system. 5
- (b) Explain different types of image format used in image representation. 5
- 4(a) Define computer based animation. Explain methods of controlling animation. 1+4
- (b) Explain the major steps of data compression in detail. 5
- 5(a) Describe reference model for multimedia synchronization. 5
- (b) What is extended architecture? Discuss principle of CD write-once. 2+3
- 6(a) Explain Open Document Architecture. 4
- (b) Explain quality of service and resource management with an appropriate figure. 6
7. Explain the concept of earliest deadline first algorithm. Compare and contrast it with rate monotonic algorithm. 4+6
8. What are the abstraction levels used in programming? Explain the advantages of object oriented approaches in brief. 5+5

**Contd. ...**

(2)

9. Write short notes on any TWO: 5+5

- (a) Transport sub-system
- (b) Video conferencing and digital libraries
- (c) Hypertext, hypermedia and multimedia



**PURBANCHAL UNIVERSITY**

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Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG203SH: Probability & Statistics (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*Students are allowed the Statistical Table (Standard Normal Table, T-distribution Table and Chi-square Table).*

**Answer EIGHT questions.**

**8×10=80**

- 1(a) Define Absolute and relative measure of dispersion and Coefficient of variation. 4
- (b) Calculate the appropriate measure of central tendencies from the following distribution and support your choice. 6

Wage in Rs.	No. of workers
Below 1000	50
1000-1999	500
2000-2999	555
3000-3999	100
4000-4999	30
5000 and above	15

- 2(a) Discuss equally likely and exhaustive events with example. 4
- (b) The probability that a new airport will get an award for its design is 0.16, the probability that it will get an award for the efficient use of materials is 0.24, and the probability that it will get both awards is 0.11. 6
- (i) what is the probability that it will get at least one of the two awards?
- (ii) what is the probability that it will get only one of two awards?
- (iii) what is the probability that it will get none of awards?
- 3(a) What do you mean by regression coefficient and write down the basic properties of regression coefficients. 1+3

**Contd. ...**

**(2)**

- (b) A sample of 12 fathers and their eldest son gave the following data about their heights in inches.
- |        |    |    |    |    |    |    |    |    |    |    |    |    |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|
| Father | 65 | 63 | 67 | 64 | 68 | 62 | 70 | 66 | 68 | 67 | 69 | 71 |
| Son    | 68 | 66 | 68 | 65 | 69 | 66 | 68 | 65 | 71 | 67 | 68 | 70 |
- Find the Coefficient of correlation by using the Karl Pearson's method.
- 4(a) Define the Binomial distribution and prove that its mean is equal to  $np$ .
- (b) In proof testing of circuit board, the probability that any particular diode will fail is 0.01. Suppose a circuit board contain 2000 diodes. (i) How many diodes would you expect fail? (ii) What is the approximate probability that at least four diode will fail on randomly selected boards?
- 5(a) What do you mean by mathematical expectation of random variable and mention its physical meaning.
- (b) Let  $X$  be a random variable with
- $$f(x) = \begin{cases} kx(3-x^2), & 0 \leq x \leq 3 \\ 0, & \text{otherwise} \end{cases}$$
- Find the value of constant 'K', mean and variance of random variable  $x$ .
- 6(a) Discuss the properties of normal distribution.
- (b) The average income of 10,000 people in an ideal city of **Republic of Nepal** is found to be normally distributed with mean Rs 75,000 and standard deviation of Rs 15,000.
- (i) If 15% are the poorest, find the minimum income of the remaining rich people.
- (ii) If 5% are the richest, find the minimum income of the richest people.
- 7(a) Define the point estimation and interval estimation. Write down the properties of good estimator and explain one of them in brief.
- (b) Hotel's manager in Kathmandu wants to know the hotels average daily registration. The following table presents the numbers of guest registered each of 27 randomly selected days. Calculate the sample mean, standard errors of mean and 95% confidence limits of population mean:
- |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|
| 61 | 57 | 53 | 60 | 64 | 57 | 54 | 58 | 63 |
| 61 | 50 | 59 | 50 | 60 | 57 | 58 | 62 | 63 |
| 60 | 54 | 54 | 61 | 51 | 53 | 62 | 57 | 60 |

**(3)**

- 8(a) What is the procedure of testing large sample test for the difference of two mean.
- (b) In Kathmandu city out of a random sample of 700 peoples 420 were found below poverty level while in Biratnagar out of 500 peoples 325 were found below poverty level. Is there any significant difference in the poverty level of the people in the two cities?
- 9(a) Define student t-distribution with its probability density function and write down its properties.
- (b) Two horses A and B were tested according to the time in seconds to run a particular track with the following results:
- |         |    |    |    |    |    |    |    |
|---------|----|----|----|----|----|----|----|
| Horse A | 28 | 30 | 32 | 33 | 33 | 29 | 34 |
| Horse B | 29 | 30 | 30 | 24 | 27 | 29 |    |
- Test whether the two horses have the same running capacity with respect to average at 5% level of significance.
- 10(a) What are the steps of test of significance of independence of attributes?
- (b) The following is the distribution of the daily number of power failures reported in a Kathmandu valley on 300 days.
- | Number of power failure | Number of days |
|-------------------------|----------------|
| 0                       | 9              |
| 1                       | 43             |
| 2                       | 64             |
| 3                       | 62             |
| 4                       | 42             |
| 5                       | 36             |
| 6                       | 32             |
| 7                       | 14             |
| 8                       | 6              |
| 9                       | 2              |
- Test at the 0.05 level of significance whether the daily number of power failures in Kathmandu valley is a random variable having Poisson distribution.
- \*\*\*

Contd. ...

**PURBANCHAL UNIVERSITY**

**2018**

B. E. (Computer)/Sixth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

**BEG391MS: Project and Organization Management (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

**Group A**

**Answer TWO questions.**

**2×8=16**

1. Describe the concept of project management. Explain social, economical and environmental impacts of project critically.
2. Draw a Critical Path Method (CPM) Network and find the project duration, critical path, critical activities early start time, late start time, early finish time, late finish time and total float for each activity.

Activity	A	B	C	D	E	F	G	H	I
Predecessor	-	A	A	A	B	C	D	C,E	F,G
Successor	B,C,D	E	F,H	G	H	I	I	-	-
Duration (Days)	10	6	4	6	4	2	6	2	4

3. What is meant by Management by Objectives (MBO). Explain the benefits from MBO program.

**Group B**

**Answer SIX questions.**

**6×4=24**

4. Explain the implication of CPM and PERT in Network Analysis.
5. Define the concept of organization and explain its characteristics briefly.
6. Explain the necessary of industrial relationship.
7. Why is Gantt chart necessary for planning and controlling of project?
8. Explain the different functions of personnel management.
9. Explain briefly about project control cycle.
10. What do you mean by Leadership Styles? Briefly explain any one of the theories on leadership.

**Contd. ...**

**(2)**

11. Write short notes on any TWO:

- (a) Work Breakdown Structure (WBS)
- (b) Function of Personnel Management
- (c) Necessity of Industrial Relation



**PURBANCHAL UNIVERSITY**

**2018**

B.E. (Computer)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG377CO: Theory of Computation (New Course)**

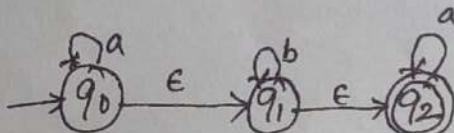
*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side.*

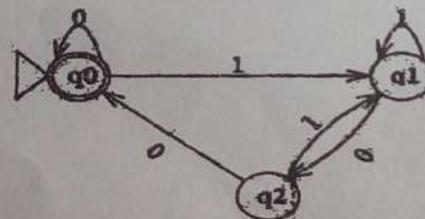
**Answer EIGHT questions.**

1(a) Define finite automata. Discuss its significance. 4

(b) Convert the following NFA to DFA: 6



2. State Arden's theorem. Use this theorem to find the equivalent RE of the following DFA. 3+7



3(a) Design a DFA that accepts language  $L(M) = \{W: WE\{a,b\}^*\}$  and W does not contain even numbers of a's and b's. 6

(b) Prove that for each NFA, there is an equivalent DFA. 4

4(a) Using the pumping lemma for regular sets prove that the language  $L = \{ww / w \in \{a,b\}^*\}$  is a palindrome} is not regular. 4

(b) Show that regular languages are closed under union and intersection. 6

5(a) When will the derivation tree be ambiguous? Explain its solution. 4

(b) Convert the following grammar into CNF: 6

$$S \rightarrow aA/bB$$

$$A \rightarrow aAA/bS/b$$

$$B \rightarrow bBB/as/a$$

**Contd. ...**

**(2)**

- 6(a) Design a Turing machine that accepts the language of all the strings of even length. 5
- (b) Design a PDA for the given language  $L = \{WCW^R : W \in \{a,b\}^*\}$ . 5
- 7(a) Differentiate between recursive and recursively enumerable languages. 5
- (b) What do you mean by instantaneous description of a TM? 5
- 8(a) Differentiate between DPDA and NPDA with an example. 4
- (b) Show that  $L = \{a^n b^n c^n \mid n \geq 0\}$  is not context free. 6
9. Write short notes on any TWO: 5+5
- (a) Computational Complexity
- (b) Church Truing Thesis
- (c) NP Complete Problems.



## PURBANCHAL UNIVERSITY

2017

B. E. (Computer/Electronics & Comm.)/Sixth Semester/Final  
Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG203SH: Probability & Statistics (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

Students are allowed the Statistical Table (Standard Normal Table, T-distribution Table and Chi-square Table).

### Group A

**Answer FOUR questions.**

**$4 \times (5+6) = 44$**

1(a) Discuss central tendency and dispersion. 3 5

(b) Define standard deviation. Scores of two golfers for 10 rounds were as follows:

Golfer A:	74, 75, 78, 78, 72, 77, 79, 78, 81, 76
Golfer B:	86, 84, 80, 88, 89, 85, 86, 82, 82, 79

Find which golfer may be considered to be a more consistent player. 6

2(a) Define probability. Hence state and prove theorem of probability. 5

(b) A bag contains 4 red and 5 black balls. The balls are drawn one after another with replacement. Find the probability of getting:  
(i) both red balls, (ii) first red and second black balls, (iii) first black and second red balls, (iv) both black balls. 6

3(a) A random variable X has the following probability function:

X	0	1	2	3	4	5	6	7
P(x)	0	k	2k	2k	3k	$K^2$	$2k^2$	$7k^2+k$

Find value of k and calculate mean and variance of X. 5

(b) Find the mathematical expectation and standard deviation of numbers on dice. 6

**Contd. ...**

Contd. . .

- (b) In a sample of 600 men from City A, 450 are found to be smokers. In a sample of 900 from City B, 550 are found to be smokers. Do the data indicate that the two cities are significantly different with respect to prevalence of smoking habit among men? 6
- (a) What are the steps in test of significance of a difference of mean for a large sample? Describe the error in hypothesis testing. 6
- (b) If 36 of 100 persons interviewed are familiar with the tax incentives for installing certain energy saving devices, construct a 95% confidence interval for the corresponding true proportion. 6
- (c) What are the steps in test of significance of a difference of mean for a large sample? Describe the error in hypothesis testing. 6

### Answer THREE questions.

#### Group B

- (a) Define the term normal distribution. 4
- (b) In a normal distribution 7% of item are under 64 and 60% of the items are over 80. Find the mean and standard deviation of the distribution. 6
- (c) Five coins are thrown simultaneously. Find the probability getting: (i) no heads, (ii) at least one head, (iii) at most 4 heads. 6
- (d) Define the term normal distribution. What are the properties of normal distribution? 4
- (e) Discuss difference between discrete probability distributions and continuous probability distributions with suitable examples. 5
- (f) From the following data calculate the regression equation of husbands and wives' age when wife's age is 20. 5
- | Husband's age: | 23 | 25 | 27 | 30 | 32 | 31 | 38 |
|----------------|----|----|----|----|----|----|----|
| Wife's age:    | 18 | 20 | 22 | 23 | 27 | 28 | 30 |
- (g) Calculate the two regression data between age of husbands and wives. 6

- 4(a) Show that mean and variance of Poisson distribution are equal. 5
- 4(b) A quality control engineer inspects a random sample of 3 batteries from each lot of 24 car batteries ready to be shipped. If batteries such a lot contains six batteries with slight defects, what are the probabilities that the inspector's sample will contain: (i) none of the batteries with defects, (ii) only of the batteries with none of the batteries with defects, (iii) all of the batteries with defects. 6

- 5(a) Discuss difference between discrete probability distributions and continuous probability distributions with suitable examples. 5

- 5(b) Five coins are thrown simultaneously. Find the probability getting: (i) at least two of the batteries with defects. 6

- 6(a) Define the term normal distribution. What are the properties of normal distribution? 4

- 6(b) In a normal distribution 7% of item are under 64 and 60% of the items are over 80. Find the mean and standard deviation of the distribution. 6

- 6(c) Five coins are thrown simultaneously. Find the probability getting: (i) no heads, (ii) at least one head, (iii) at most 4 heads. 6

- 6(d) Calculate the two regression data between age of husbands and wives' age when wife's age is 20. 5
- | Husband's age: | 23 | 25 | 27 | 30 | 32 | 31 | 38 |
|----------------|----|----|----|----|----|----|----|
| Wife's age:    | 18 | 20 | 22 | 23 | 27 | 28 | 30 |

- 6(e) Calculate the two regression data between age of husbands and wives. 6

## PURBANCHAL UNIVERSITY

2017

B. E. (Computer)/Sixth Semester/Final  
Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

**BEG391MS: Project and Organization Management (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

### Group A

**Answer TWO questions.**

**2×8=16**

1. What do you understand by project and project life cycle? Explain briefly the activities to be done in the implementation phase of the project.
2. What is management? Discuss the functions and roles of management in detail.
- 3(a) Draw the network diagram of the project from the provided information at the project given in the table below: Compute Earliest Start time (EST), Latest Start Time (LST) Earliest Finish Time (EFT), Latest Finish Time (LFT) and total float (Slack Time).
- (b) Determine the critical Path of the project path of the project.

Activity	A	B	C	D	E	F
Predecessor	-	-	B	A	A	C,E
Expected Time	14	19	15	6	12	3

### Group B

**Answer SIX questions.**

**6×4=24**

4. What is organization? What are its features?
5. Discuss the characteristics of project management.
6. Differentiate between CPM and PERT.
7. Define Job Analysis and Job description.
8. Explain the process of Management by objectives.
9. Explain different styles of leadership.
10. Describe trade union and trade union movement in Nepal.
11. Define motivation. Discuss MC Gregor's Theory of motivation.



## PURBANCHAL UNIVERSITY

2017

B.E. (Civil/Computer/Electronics & Comm.)/Sixth Semester /Final  
Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG395MS: Engineering Economics (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

**Answer FIVE questions.**

- 1(a) Define cash flow. Explain different economic systems. 2+4
- (b) Estimate the price of cement if demand is 10,000 bags, when the consumption pattern is shown below: 10

S.N.	Price (Rs. Per bag)	Demand (Bags)
1	700	1000
2	680	1200
3	590	2000
4	650	1500
5	730	800
6	620	1800
7	550	2500
8	530	3000
9	500	5000
10	570	2200

- 2(a) Differentiate prime cost from overhead cost. Explain about process costing. 6

- (b) Perform sensitivity analysis by investigating its Aw over a range of  $\pm 30\%$  changes in estimates for: 10

- (i) Investment (ii) Annual net cash flow  
(iii) Market value (iv) Useful life

Investment cost= Rs. 12,00,000

Annual revenue= Rs. 2,00,000

Annual expenses= Rs. 50,000

Market value= Rs. 1,50,000

Useful life= 6 years

MARR= 8%

Contd. ...

(3)

12

PW method. Take MARR = 10%.

List all possible alternatives and select the best alternative using

Decision Tree and its use with an example.

3(a)

Describe Decision Tree and its use with an example.

6

List all possible alternatives and select the best alternative using

PW method. Take MARR = 10%.

Writess short notes any FOUR.

6.

(a) Cost Variance Analysis

(d) Drawbacks of IRR

(c) Break-even Analysis

(d) Depreciation and Recaptured Depreciation

(e) Market Research

Initial Investment (Rs.)

100,000

150,000

Annual Revenue (Rs.)

45,000

60,000

Annual Expenses (Rs.)

10,000

15,000

Salvage Value (Rs.)

8,000

12,000

Use IRR method to select the better of two mutually exclusive

investment options, given below:

10

Use IRR = 10 % annually.

Project X

Project Y

Net Cash Flow (Rs.)

0

-55,000

1

-15,000

2

20,000

3

25,000

4

20,000

5

30,000

6

Use PW and AW methods for analysis. Take MARR = 10%/year.

(b)

Sharewan wishes to take a loan of Rs. 1 million from a bank, for a

period of 10 years. Should the bank forward the loan? What

would be his monthly instalment at an interest rate of 10%

per year?

4(a)

Explain about Taxation laws of Nepal.

4

compounded monthly?

(b)

Engimetre Projects A, B, C, D and E are being considered with

cash flows as shown:

4(b)

Contd. ....

Particulars	Projects					Contd. ....
	A	B	C	D	E	
Capital Investment (Rs.)	40000	25000	90000	75000	100000	Market Value (Rs.)
Annual Revenue (Rs.)	10000	7000	18000	14000	20000	4000
Annual Expenses (Rs.)	10000	7000	18000	14000	20000	2500
Profit Margin (%)	25	21	50	29	50	9000
Mutually Exclusive						7500
Contingent to B						10000
Contingent to A						10000
Mutually Exclusive						10000
Project C						10000
Project D						10000
Project E						10000

**PURBANCHAL UNIVERSITY**

**2017**

B.E. (Computer)/Sixth Semester/Final

Time: 03:00 hrs.

**BEG377CO: Theory of Computation (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

**Answer EIGHT questions.**

- 1(a) Define finite automata. Discuss its significance. 4
- (b) Using the mathematical induction principle prove that:  
$$1+3+5+\dots+(2n-1)= n^2$$
 6
- 2(a) Explain moves of a PDA. 5
- (b) Discuss decision algorithm for Context Free Language. 5
- 3(a) Design a DFA to accept the language containing sub-string 0001 over the alphabet  $\Sigma = \{0,1\}$ . 5
- (b) Prove with an example of your own that for each NFA, there is 5 an equivalent DFA. 5
- 4(a) Using the pumping lemma for regular sets prove that the language  $L = \{ww / w \in (a,b)^*\}$  is a prime; is not regular. 4
- (b) Show that regular languages are closed under union and intersection. 6
- 5(a) How do you remove useless and unit productions from a CFG solution? 5
- (b) Convert following CFG into CNF:  
S->aXX  
X->as/bs/a 5
- 6(a) Design a Turing machine that accepts the language of all the strings of even length. 5
- (b) Design a PDA for the language containing equal number of a's followed by equal number of b's. 5

**(2)**

- |      |   |     |
|------|---|-----|
| 7(a) | Differentiate between recursive and recursively enumerable languages. | 5   |
| (b)  | What do you mean by instantaneous description of a TM?                | 5   |
| 8.   | Discuss ambiguous grammar and s-grammar with examples.                |     |
|      | Explain the significance of universal turing machine.                 | 6+4 |
| 9.   | Write short notes on any TWO:   | 5+5 |
| (a)  | Computational Complexity  |     |
| (b)  | Church Turning Thesis   |     |
| (c)  | NP complete problems  |     |
- \*\*\*

**PURBANCHAL UNIVERSITY**  
**2017**

B. E. (Computer) / Sixth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG376CO: Multimedia Computing & Technology (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Necessary Tables are may be used.*

**Answer EIGHT questions.**

- 1(a) Explain term Multimedia. Explain different classifications of medium. 1+3
- (b) Explain different data streams characteristics in detail. 6
- 2(a) Explain the mechanism for generation of speech. 5
- (b) Explain MIDI with MIDI Messages. 5
- 3(a) Explain fundamental steps for Digital Image Processing. 5
- (b) Explain image formats and graphics formats in detail. 5
- 4(a) Differentiate between video and animation. Explain different types of animation language. 2+3
- (b) Explain the compression technique for still images. 5
- 5(a) Explain about Open Document architecture. 5
- (b) QOS is a key factor for quality multimedia communication system. Explain. 5
- 6(a) What are the concerns of Multimedia Operating System? Explain. 6
- (b) What are the two real time scheduling algorithm? Discuss. 4
- 7(a) Multimedia Application should have higher abstraction from Multimedia Hardware detail. Justify this statement. 4
- (b) Explain reference model for multimedia synchronization with an appropriate figure. 6

**Contd. ...**

**(2)**

- 8(a) What is Group Communication Architecture? What are its components? 5
- (b) Write your views on Group Rendezvous. 5
9. Write short notes on any TWO: 5+5
- (a) Video disk fundamental
  - (b) Video Conferencing
  - (c) Resource Management



**PURBANCHAL UNIVERSITY**

**2017**

B.E. (Computer) / Sixth Semester / Final  
Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG375CO: Computer Network (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side.*

**Answer EIGHT questions.**

- 1(a) What is computer Network? Explain your personal view to justify any two network topologies which you think is the most important to build a stable network. 7
- (b) Briefly discuss RS232. 3
- 2(a) Why is congestion occurring in Network? 3
- (b) Explain leaky bucket algorithm with a diagram. 7
- 3(a) What is framing? Explain starting and ending flag with bit stuffing with example. 2+5
- (b) What is jitter control in Computer Network? 3
- 4(a) Explain different kind of services that are benefited from the networking technology in today's world. 5
- (b) Discuss various layers in OSI reference model. 5
- 5(a) What is firewall and information security? 3
- (b) Discuss digital signature for secure communication in computer network system. 7
- 6(a) Sketch the IPV4 frame format. 5
- (b) Differentiate between IPV4 and IPV6. 5
- 7(a) Why Subnetting is used in IP? 3

**Contd. ...**

**(2)**

- (b) Write IP address range of A, B, C, D class with default subnet mask. 7
- 8(a) Why are we using routing algorithms? Explain shortest path routing algorithm with example. 1+5
- (b) Explain SPADE and PCM briefly. 4
9. Write short note on any TWO. 5+5
- (a) TCP/IP
  - (b) FDDI
  - (c) SMTP and IMAP



**PURBANCHAL UNIVERSITY**  
**2016**

B.E. (Computer)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG375CO: Computer Network (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side.*

**Answer EIGHT questions.**

- 1(a) Differentiate between OSI reference model and TCP/IP model. 4
- (b) Differentiate between TCP and UDP protocol. 1+5
- 2(a) Briefly explain about hub, switch and router in terms of collision domain and broadcast domain. 1+4
- (b) Explain with suitable example about multicast, unicast and broadcast addressing. 5
- 3(a) Explain briefly about different kinds of transmission media used in computer networks. 4
- (b) Describe and distinguish between FDMA and TDMA. 2+4
- 4(a) Briefly explain about IEEE 802.4 frame format. 2+2
- (b) List out different types of error detection and correction techniques. How Hamming code is different from CRC? 2+2+2
- 5(a) Explain leaky bucket algorithm and compare it with token bucket algorithm. 4
- (b) What are the routing algorithms? Briefly explain about distance vector and link state routing algorithms with suitable example. 2+4
6. Briefly explain application layer protocols HTTP, SMTP, POP and IMAP. 10

Contd. ...

**(2)**

- 7(a) What is sub-netting? Why is it so important in IP addressing?  
Briefly explain different types of classes of IP addresses with their  
network and host addresses. 1+2+4
- (b) What is the importance of IPv6 over IPv4? 3
- 8(a) Discuss jitter control. 4
- (b) Discuss importance of gateways and bridges. 6
9. Write short note on any TWO. 5+5
- (a) Symmetric cryptography (DES, AES)  
(b) ICMP  
(c) Substitution Cipher



# PURBANCHAL UNIVERSITY

2016

B.E. (Civil/Computer/E. & C.)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG395MS: Engineering Economics (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side.*

**Answer FIVE questions.**

**5×16=80**

1(a) Explain the principles of Engineering Economics. Explain the economic system of Nepal. 8

(b) Find prime cost, overhead cost, non manufacturing costs, total cost and profit for the following: 8

Direct material : Rs. 24,00,000

Direct labor : Rs. 5,00,000

Depreciation for factory building : Rs. 1500

Branch office expenses : Rs. 40,000

Depreciation for office building : Rs. 8,000

Depreciation of staff cars : Rs. 12,000

Insurance:

Staff cars : Rs. 1500

Office building : Rs. 1200

Factory building : Rs. 1500

Delivery van maintenance and running expenses : Rs. 1600

Salaries including sales manager and factory chief engineer : Rs. 3,00,000

Salary of sales manager : Rs. 25,000

Factory chief engineer : Rs. 25,000

Finished goods warehouse expenses : Rs. 20,000

Electricity (including Rs. 4000 for administrative office) : Rs. 40,000

Advertisement : Rs. 20,000

Sundry factory expenses : Rs. 3,40,000

Sales promotion : Rs. 5,000

Office administration expenses : Rs. 50,000

Expenses for participating in industrial exhibition : Rs. 10,000

Sales : Rs. 42,00,000

**Contd. ....**

(2)

- 2(a) A Construction Company is assigned to start up a new office in a city. Two lease options are available, each with a first cost, annual lease cost, and deposit-return estimates shown below:

	Location X	Location Y
First Cost (Rs.)	-150000	-190000
ADC (Rs.)	-35000	-32000
Deposit Return (Rs.)	10000	22000
Life (years)	6	9

Determine which lease option should be selected on the basis of a present worth comparison, if the MARR is 12% per year.

- (b) What do you mean by payback period? What are their significances and drawbacks? Find the payback periods of given cash flow:

Initial investment	: Rs. 25,000
Net annual revenue	: Rs. 8,000
Salvage value	: Rs. 5000
Useful life	: 5 years
MARR	: 12%

- 3(a) Three mutually exclusive alternative are currently under consideration. Their respective costs and benefits are included in the table below. Each of the projects has a useful life of 25 years, and the nominal interest rate is 18% per year. Use IRR to recommend best alternative.

	Initial Investment (Rs.)	Annual O&M Cost (Rs.)	Salvage Value (Rs.)	Annual Benefits (Rs.)
A	85000	7500	12500	21500
B	100000	7250	17500	22650
C	120000	7000	20000	25000

- (b) List out the drawbacks of IRR method? How can we eliminate some of these drawbacks?

- 4(a) Suppose that Rs. 100000 is deposited in Bank Account at the end of each quarter over the next twenty years. What is the future worth at the end of 20 years when the interest rate is 12% compound (i) quarterly, (ii) monthly, (iii) continuously.

Contd. ....

(3)

- (b) Find both type of B/C ratio using AW and FW formulation of the following project and determine whether the project is feasible or not?

Initial investment= Rs. 500000  
Annual revenue= Rs. 80,000  
Annual expenses= Rs. 15,000  
Salvage value= Rs. 10,000  
Useful life= 20 years  
MARR= 10%

- (c) Consider the following accounting information for a computer system:

Cost-basis, I= Rs. 10,000  
Useful life, N= 5 years  
Estimated salvage value= Rs. 778

Compute the annual depreciation allowances and the resulting book values using the double declining depreciation method.

	Alternatives	
	A	B
Capital Investment (Rs.)	3500	5000
Annual Revenue (Rs.)	1900	2500
Annual Expenses (Rs.)	645	1020
Useful life (yrs)	5	5
Salvage value (Rs.)	0	0

- 5(a) What shall be the demand if price is set to be Rs.75/kg? Use linear regress model.

S.No.	Price (Rs/kg)	Demand (Kg)
1	62	280
2	68	310
3	78	350
4	88	370
5	85	360
6	53	250
7	71	320
8	66	290
9	67	300

Contd. ....

(4)

- (b) Suppose that there are two alternative electric motor that provide 100 HP output:

Item	Alpha Motor	Beta Motor
Purchase Cost	Rs. 1250000	Rs. 1600000
Efficiency	74%	92%
O & M Cost	Rs. 50000 per year	Rs. 25000 per year
Life	10 years	10 years
Annual tax and insurance	1.5% of the investment	1.5% of the investment
MARR	15%	15%

- (i) How many hours per year would the motors have to be operated at full load for the annual cost to be equal?  
Electricity cost= Rs. 5/kw.
- (ii) If annual operation hour is 600 hrs., which motor should be selected?

6. Write short notes on any FOUR:

4×4=16

- (a) VAT
- (b) Recaptured depreciation
- (c) Differed annuity
- (d) Decision Tree ->
- (e) Market Research

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**PURBANCHAL UNIVERSITY**  
**2016**

B. E. (Computer)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG376CO: Multimedia Computing & Technology (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Necessary Tables are may be used.*

**Answer EIGHT questions.**

- 1(a) Explain multimedia with its application in modern education. 4
- (b) Describe data stream characteristics of multimedia system. 6
2. Define MIDI with synthesizer device. Explain different speech general system. 5+5
3. Explain image with digital representation. Describe various image recognition steps with the help of suitable diagram. 4+6
- 4(a) Explain the important measures that define visual representation. 6
- (b) Explain the principle of CD-WO 4
5. Explain the importance of compression technique. What are different compression techniques used? Explain major steps of data compression. 2+2+6
6. Describe document architecture ODA. Compare hypertext, hypermedia and multimedia. Explain SGML. 2+6+2
- 7(a) Describe group communication architecture with suitable diagram. 5
- (b) Define QoS? Explain important issues needed to be considered with respect to QoS. 1+4
- 8(a) What is abstraction for programming? Explain different abstraction level. 1+5

**Contd. ...**

**(2)**

- (b) Explain video conferencing technique. 4
9. Define synchronization with Inter and Intra object synchronization. Explain MM synchronization with four layer reference model. 2+3+5
10. Write short notes on any TWO: 5+5
- (a) Information System
  - (b) Multimedia Operating System
  - (c) MPEG and DVI



# PURBANCHAL UNIVERSITY

2016

B. E. (Computer)/Sixth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

**BEG391MS: Project and Organization Management (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

## Group A

**Answer TWO questions.**

**2×8=16**

1. Define project. What do you mean by project environment? Describe three main project environments.
2. Draw a CPM network for the project activities shown below. Calculate EST, EFT, LST, LFT, FF, TF, IF, Int F and the critical path of the project.

Activity	A	B	C	D	E	F	G	H	I
Immediate Predecessor	-	-	-	A	A	B,D	C	C	F,G
Duration	6	8	9	10	13	11	10	10	10

3. "Management is the art of getting things done through people." Do you agree with this statement? Explain functions and skills of management.

## Group B

**Answer SIX questions.**

**6×4=24**

4. Define organization and list out its types.
5. Explain the different levels of management.
6. What do you mean by project control cycle? Explain with figure.
7. What are the primary uses of job description?
8. Discuss about management by objectives. Why is it important for middle level management?
9. Explain goal setting theory of motivation.
10. Explain the trade union movement in Nepal.
11. Describe the Project Information Management System.

**PURBANCHAL UNIVERSITY**  
**2016**

B. E. (Computer/Electronics & Comm.)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG203SH: Probability & Statistics (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*Students are allowed the Statistical Table (Standard Normal Table, T-distribution Table and Chi-square Table).*

**Answer EIGHT questions.**

**8x10=80**

- 1(a) Discuss the functions and limitations of Statistics.
- (b) The mean and standard deviation of set of 50 observations were found to be 40 and 12 respectively. On checking, it was found that two observations were wrongly taken as 23 and 15 instead of 43 and 18. Calculate correct mean and standard deviation.
- 2(a) What do you mean by correlation. Discuss the properties of correlation coefficient( $r$ ).
- (b) Fit the regression equations of Y on X from the following data:

X	11	12	13	14	15	16
Y	11	13	15	17	19	20

Also, estimate y when x=30.

- 3(a) Write short notes on:
  - (i) Dependent and independent events
  - (ii) Sample space and exhaustive events.
- (b) A husband and wife appears in an interview for two vacancies in the same post. The probability of husband's selection is  $1/7$ , and that of wife's selection is  $1/5$ . What is the probability that:
  - (i) both of them will be selected?, (ii) only one of them will be selected?, (iii) none of them will be selected?
- 4(a) Discuss on probability mass function and distribution function.
- (b) The probability density function of a random variable X is given below:

$$f(x) = \begin{cases} Kx^3 & 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

**Contd. ...**

(2)

- (i) If  $f(x)$  is a probability density function find the value of  $K$ .  
 (ii) Find the mean and variance of  $X$ .

5(a) Under what conditions Binomial Distribution possesses Poisson Distribution? Explain.

- (b) A certain screw making machine produces on an average 3 defective screws in a lot. Find the probability that this lot has:  
 (i) none of the screw are defective  
 (ii) at least one of the screw are defective  
 (iii) exactly one of the screw is defective

- 6(a) Define normal distribution. Discuss the property of normal distribution.

- (b) A sample of 100 mobile battery cells tested to find the length of life produced the following results as mean 13 months and standard deviation of 3 months. Assuming that the data are normally distributed. What percentage of battery cells expected to have life (i) more than 15 months? (ii) less than 6 months? (iii) between 8 months and 12 months?

- 7(a) Define the terms population parameter and sample statistics. Write down the standard error of mean and proportion.

- (b) The quality control engineer at a light bulb factory needs to estimate the average life of a large shipment of light bulbs. The process standard deviation is known to be 100 hours. A random sample of 64 light bulbs indicated a sample average life of 350 hours. Calculate the standard error of mean. Set up 95% and 99% confidence interval of the true average life of light bulbs in this shipment.

- (c) Write down the necessary steps of hypothesis testing of difference of proportion.

- (d) A Company claims that its light bulbs are superior to those of its main competitor. If a study showed that a sample of 40 of its bulb has mean lifetime of 647 hours of continuous use with standard deviation of 27 hours, while a sample of 40 bulbs made by its main competitor had mean lifetime of 638 hours of continuous use with standard deviation of 31 hours, does this substantiate the claim at 5% level of significance?

Contd. ...

(3)

- 9(a) Define t-distribution and write down the application of t-distribution.

- (b) Two independent samples of 7 and 8 items respectively had the following values, whether these two samples are drawn from a sample population or not.

Sample-I	9	11	13	11	15	9	12	14
Sample-II	10	12	10	14	9	8	10	-

- 10(a) Define chi-square test. What are the applications of chi-square test?

- (b) Test of the fidelity and selectivity of 190 radio receivers produced the results shown in the following table. Use the 0.05 level of significance to test whether there is a relationship between fidelity and selectivity.

Selectivity \ Fidelity	Low	Average	High
Low	6	12	32
Average	33	61	18
High	13	15	0

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# PURBANCHAL UNIVERSITY

2016

B.E. (Computer) / Sixth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG377CO: Theory of Computation (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

**Answer EIGHT questions.**

- 1(a) Discuss the importance of finite automata in the field of computer science. 4
- (b) Design a DFA to accept the language that contain substring 0111 over the alphabet {0,1}. 6
- 2(a) Convert the following Non deterministic finite automation (NDFA) in DFA. 6



- (b) Find the regular expression for the following languages over the alphabet {0,1}: 2+2  
(i) with four consecutive zeros                                  (ii) ending with 01
3. Describe pumping lemma for regular languages. Prove that the language,  $L = \{0^n 1^n \mid n \geq 1\}$  is not regular language. 5+5
- 4(a) Let G be the grammar having the following productions:  
 $S \rightarrow 0B \mid 1A, A \rightarrow 0 \mid 1AA, B \rightarrow 1 \mid 1S \mid 0BB$   
For the string 00110101, find: (i) the leftmost derivation, (ii) the rightmost derivation. 3+2
- (b) Reduce the given grammar to Chomsky Normal form. 5

$$\begin{aligned} S &\rightarrow bA \mid aB \\ A &\rightarrow bAA \mid aS \mid a \\ B &\rightarrow aBB \mid bS \mid b \end{aligned}$$

Contd....

**(2)**

5(a) Find a grammar equivalent to

$$S \rightarrow AB \mid CA$$

$$A \rightarrow a$$

$$B \rightarrow BC \mid AB$$

$$C \rightarrow aB \mid b$$

with no useless symbols.

5

(b) What are intractable problems? Discuss.

5

6(a) What is push down automaton (PDA)?.

3

(b) Design a PDA accepting the language

7

$$L = \{a^n b^n \mid n \geq 1\} \text{ by final state.}$$

7. What is Turing machine? Describe its working principle. Design a Turing machine that accepts the language:

2+3+5

$$\{a^n b^n \mid n \geq 1\}$$

8. Explain pumping lemma for context free language. Discuss how it is used to prove that a language is not context free using a suitable example.

3+7

9(a) Discuss about the Universal Turing machine.

5

(b) Discuss about time complexity with the help of a suitable example.

5

10. Write short notes on:

5+5

(a) Properties of recursive and recursively enumerable language

(b) Closure properties of context free language

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# PURBANCHAL UNIVERSITY

2017

B.E. (Computer) / Sixth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG375CO: Computer Network (New Course)**

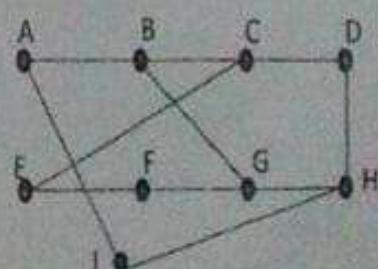
*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side.*

**Answer EIGHT questions.**

- 1(a) Define computer network. Discuss any four application of computer network. 5
- (b) What is network topology? Explain different types of network topology. 5
- 2(a) What is transmission media? What are different types of media? Explain. 5
- (b) Describe how CSMA/CD works. 5
- 3(a) What is Multiplexing? Describe time division and frequency division multiplexing techniques. 5
- (b) What do you mean by packet switching? 5
- 4(a) A bit word 1011 is to be transmitted. Construct the even parity seven-bit Hamming code for this data. 5
- (b) Explain go back N sliding window protocol. 5
- 5(a) Explain link state routing algorithm. 5
- (b) For the given network construct a new routing table for node I using distance vector routing algorithm on the basis of given information. 5

From\To	A	B	C	D	E	F	G	H	I	
A	0	10	24	38	12	24	16	19	9	IA Delay = 8
H	20	31	19	8	30	19	6	0	7	IH delay = 12



- 6(a) What do you mean by congestion in network? How congestion occurs in network? 5

Contd...

**(2)**

- (b) Differentiate between Leaky bucket and Token bucket algorithm. 5
- 7(a) Give the overview of TCP/IP. How it differs from OSI reference architecture? 5
- (b) Draw a packet format for UDP. Describe each field in brief. 5
- 8(a) A company is granted a site address 201.70.64.0. The company needs six subnets. Design the subnets. 5
- (b) What is firewall? Describe the basic components of firewall. 5
9. Write short note on any TWO.  $2 \times 5 = 10$
- (a) Connection oriented and connection less service  
(b) FDDI  
(c) OSI reference architecture.  
(d) Router and Bridge



# PURBANCHAL UNIVERSITY

2017

B.E. (Civil/Computer/Electronics & Comm.)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG395MS: Engineering Economics (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

**Answer FIVE questions.**

- 1(a) Explain Principles of engineering economics. 6
- (b) A man aged 40 years now had borrowed Rs. 500,000 from a bank for his further studies at the age of 20 years. Interest was charged at 11% per year compounded quarterly. He wished to pay loan in semiannual equal installments with the first installment being 5 years after receiving the loan now. What did he pay in each installment? 10
- 2(a) Explain elements of costs and describe direct cost and indirect cost with suitable examples. 6
- (b) Based on following information calculate: a. Variable overhead variance and b. fixed overhead Variance. 7 10

	Standards	Actual
Production (Units)	4,000	3,900
Working days	20	21
Fixed overhead (Rs)	40,000	39,000
Variable overhead	12,000	12,000

- 3(a) What do you mean by break even analysis? Explain with figure. 6
- (b) An engineering firm is considering the following mutually exclusive projects. 8

EOY	Project A1	Project A2	Project A3	Project A4
0	-2500	-1200	-3600	-2000
1	1200	400	1700	800
2	1400	800	2000	700
3	1500	1000	1600	850

Which project should be selected based on IRR method, assuming MARR=15% per year. 10

Contd. ...

5(a) Explain taxation system in Nepal.

(b) Following table shows the annual per capita consumption in Kg. of fish when the price in RS. Make Hypothesized regression equation and find out the consumption if the price is set as 145 Rs. Per kg.

12

S.N.	Price/Kg	Demand
1	125	68
2	110	75
3	114	58
4	102	72
5	150	55
6	120	65
7	135	62
8	175	50
9	128	62
10	135	64

5(a) Describe the value of money with suitable examples.

6

(b) Find IRR and ERR of the following project, MARR=€=15%.

10

Year	0	1	2	3	4	5
Cash flow (Rs.) in Lakh	-50	10	10	10	40	50

6(a) Suppose that there are two alternative electric motors that provide 100hp output.

12

Item	Alpha motor	Beta motor
Purchase cost (Rs.)	12500	16000
Efficiency	74%	92%
Maintenance (Rs.)	500 per year	250 per year
Life (Year)	10	10
Annual tax & insurance	1.5% of the investment	1.5% of the investment
MARR	15%	15%

- (i) How many hours per year would the motors have to be operated at full load for the annual cost to be equal?  
Electricity cost= Rs. 0.05 per KW hour.
- (ii) If annual operation hour is 600 hrs. Which motor should be selected?
- (b) Writes short notes any TWO:
- (a) Methods of depreciation
  - (b) Decision Tree
  - (c) Cash flow

2×2=4

**PURBANCHAL UNIVERSITY**  
**2017**

B. E. (Computer) / Sixth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG376CO: Multimedia Computing & Technology (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Necessary Tables are may be used.*

**Answer EIGHT questions.**

1. Describe properties of multimedia system. Explain data stream characteristics for continuous media. 4+6
2. How is sound and audio generated? Explain various components of speech analysis. 5+5
3. Define characteristics of television system. Explain techniques of animation control mechanism. 4+6
4. Explain advantages and disadvantages of compression technique. ✓ Compare with application area of lossy, lossless and hybrid coding. 4+6
5. Define basic technology of optical storage media. Explain principle and area of CD-magneto optical. 4+6
6. Compare hypertext, hypermedia and multimedia. Explain document architecture SGML. 4+6
7. Explain importance and issue of synchronization. Define MM synchronization with four layer reference model. 4+6
8. Discuss relation between QoS and resources. Explain resource management architecture in multimedia communication architecture. 4+6
9. Write short notes on any TWO:
  - (a) Real-time schedule
  - (b) Toolkit and libraries
  - (c) Video -on demand and video conferencing



**PURBANCHAL UNIVERSITY  
2017**

B. E. (Computer) / Sixth Semester / Final

Time: 01:30 hrs.

Full Marks: 40 / Pass Marks: 16

**BEG391MS: Project and Organization Management (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

**Group A**

**2x8=16**

**Answer TWO questions.**

1. Define project. Describe the four main phases of the project life cycle.
2. Draw a CPM network for the project activities shown below. Calculate EST, EFT, LST, LFT, FF, TF, IF, Int F and the critical path of the project.

Activity	A	B	C	D	E	F	G	H	I	J	K
Duration (Days)	12	14	6	10	6	6	7	7	10	6	15
Predecessor	-	-	A	A	B	B	E	C,G	C,G	F,H	D,I,J

3. "Management is the art of getting things done through people or others." Are you agree with this statement? Explain.

**Group B**

**6x4=24**

**Answer SIX questions.**

4. Define organization and list out its types.
5. What do you mean by project environment? Explain its components.
6. Differentiate between CPM and PERT.
7. What are the primary uses of job analysis?
8. Explain project Management Information System (PIMS).
9. Explain dual factor theory of motivation.
10. Explain the trade union movement in Nepal.
11. Describe the importance of HRM



**PURBANCHAL UNIVERSITY**  
**2017**

B. E. (Computer/Electronics & Comm.)/Sixth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG203SH: Probability & Statistics (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

Students are allowed the Statistical Table (Standard Normal Table, T-distribution Table and Chi-square Table).

**$8 \times 10 = 80$**

**Answer EIGHT questions.**

- 1(a) Calculate the median marks of following students. 4

Marks	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	12	16	42	45	36	9

- ✓(b) Calculate the coefficient of mean deviation from mean from the following information. 6

Temp( $^{\circ}$ C)	0-10	10-20	20-30	30-40	40-50
No. of days	5	12	25	18	2

- ✓(a) Define and compare correlation and regression. Write down the basic properties of regression. 4

- (b) By using the regression analysis estimate the most probable price of the product if the supply is 70. 6

Price (Rs)	160	162	165	161	163	164	166
Supply	62	63	64	63	62	66	68

- ✓(a) State and prove the Bayes's theorem of probability. 4

- (b) The probability that a new airport will get an award for its design is 0.16, the probability that it will get an award for the efficient use of materials is 0.24, and the probability that it will get both awards is 0.11. 6

(i) What is the probability that it will get at least one of the two awards?

(ii) What is the probability that it will get only one of two awards?

(iii) What is the probability that it will get neither awards?

- ✓(a) Define and compare probability mass function and probability density function. 4

**Contd. ...**

(2)

- (b) The probability density function of a random variable X is given below as: 6

$$f(x) = \begin{cases} Kx^2, & 0 < x < 3 \\ 0, & \text{otherwise} \end{cases}$$

- (i) If  $f(x)$  is a probability density function find the value of constant k  
(ii)  $P(1 < x < 2)$       (iii) find the mean of random variable X.

- 5(a) Define the Binomial Distribution also prove that the mean of binomial distribution is ' $np$ '. 4

- (b) From the past experience it is known that in a certain intersection of road, there are on the average 4 traffic accidents per week. Find the probability that, in a given week there will be 6

- (i) Less than 2 accidents  
(ii) Exactly 2 accidents  
(iii) More than 2 accidents

- 6(a) Define Standard normal distribution. Write down the basic properties of normal probability curve. 4

- (b) If the voltage supply for a particular circuit board follows normal distribution and 7% of the time voltage is under 210 and 89 % of the time the voltage is under 335. Find the mean and the standard deviation of voltage supply. 6

- 7(a) What do you understand by the standard error write down the standard error of sample mean and sample proportion. 4

- (b) Random sample of 400 villagers and 900 municipal people were asked whether they would like certain TV program, 250 villagers and 540 municipal were in favor of that TV program. Set up the 95% and 99% confidence limits for the difference of proportion in whole country. 6

- 8(a) Write down the steps involved in the test of significance of difference of proportion. 4

- (b) A whole sale dealer wanted to buy a large quantity of light bulbs from two brands label A and B. He bought 100 bulbs from each bulbs brand and found by testing that brand A had mean life time 1120 hours and standard deviation 75 hours and brand B had mean life time 1062 hours and standard deviation 82 hours. Test at 5% level of significance that whether the average life of two brand has same or not? 6

Contd. ...

(3)

- ✓ 9(a) Define student t-distribution. What are the assumptions made while testing the single mean for small sample? 4
- (b) If a study of the effectiveness of physical exercise in weight reduction a group of 16 persons engaged in a prescribed program of physical exercise for one month showed the following results of weight in pound. 6

Before	209	178	169	212	189	192	158	180	170	153	183	165	201	179	243	144
After	196	171	170	207	177	190	159	180	164	152	179	162	199	173	231	140

Use the 1% level of significance to test whether the prescribed program exercise is effective.

- 10(a) How the goodness of fit is tested? Explain it by suitable steps. 4
- (b) The following is the distribution of the daily number of power failures reported in a Kathmandu valley on 300 days. 6

Number of power failure	Number of days
0	9
1	43
2	64
3	62
4	42
5	36
6	22
7	14
8	6
9	2

Test at the 0.05 level of significance whether the daily number of power failures in Kathmandu valley is a random variable having Poisson distribution with parameter  $\lambda=3.2$ .



**PURBANCHAL UNIVERSITY**  
**2017**

B.E. (Computer) / Sixth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG377CO: Theory of Computation (New Course)**

*Candidates are required to give their answers in their own words as far as practicable.*

*All questions carry equal marks. The marks allotted for each sub-question is specified along its side.*

**Answer EIGHT questions.**

- 1(a) Explain induction principle with suitable example. 4
- (b) Define DFA. Design a DFA that accepts the language  $L = \{x \in \{0,1\}^* : 0110 \text{ occurs as a substring in } x\}$ . 6
- 2(a) Define PDA. Construct a Push Down Automata (PDA) that accepts the language  $L = \{a^n b^{2n} \mid n > 0\}$ . 5
- (b) "Regular languages are closed under union, concatenation and kleene star operation". Discuss. 4
- 3(a) State Pumping lemma for regular languages. Use pumping lemma to prove that  $L = \{a^n b^{2n} : n \geq 1\}$  is not regular. 5
- (b) Define Context Free Grammar (CFG) with proper example. Explain the significance of Context Free Grammar (CFG) in Theory of Computation. 5
4. Define Turing Machine Formally. Design a Turing machine which accepts the set of all palindromes over alphabets {0, 1}. 3+7
5. Describe CNF. For a CFG given by  $G = (V, \Sigma, R, S)$  with  $V = \{S\}$ ,  $\Sigma = \{a\}$  and production rule  $P$  is defined as: 4+6
- S  $\rightarrow$  SS,
- S  $\rightarrow$  a, obtain the language generated by L(G).
- 6(a) What are the various steps involved in converting a NFA into DFA? Explain with the help of suitable example. 7
- (b) Differentiate Recursive and Recursively enumerable language. 3
- 7(a) Describe P and NP problems with suitable example. 5
- (b) Explain pumping lemma for context free languages with an example. 5

Contd. ...

**(2)**

- 8(a) What are undecidable problems? In what sense are they different from intractable problems? 3+3
- (b) Describe Church Turing Thesis. 4
9. Write short notes on any TWO: 5+5
- (a) Universal Turing Machine
  - (b) Halting Problem
  - (c) GNF

