

**II B. Tech II Semester Regular Examinations, April/May - 2016**  
**ENVIRONMENTAL STUDIES**  
(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
2. Answer **ALL** the question in **Part-A**  
3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

1. a) Write about global warming and climate change. (4M)
- b) Write about equitable use of resources for sustainable lifestyles. (4M)
- c) Write about genetic diversity (3M)
- d) What are the causes of air pollution? (4M)
- e) What is rain water harvesting? (4M)
- f) What is EMP? (3M)

**PART -B**

2. a) What are the structure and function of an grassland ecosystem? (8M)
- b) Write about forest ecosystem. (8M)
3. a) What is deforestation? How is waste land reclaimed? (6M)
- b) Write about use and over utilization of surface and ground water. (10M)
4. a) What are the different values of biodiversity? (8M)
- b) Write about endangered and endemic species. (8M)
5. What are the causes, effects and control measures of water pollution? (16M)
6. a) What are the effects of resettlements and rehabilitation? (8M)
- b) Write about wild life protection act (8M)
7. Write a field report on the visit to a polluted river (16M)

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**PART -A**

1. a) Write about ozone layer depletion. (4M)
- b) Write about the effects of overuse and exploitation of mineral resources. (4M)
- c) Write about ecosystem diversity. (3M)
- d) Write about noise pollution (4M)
- e) What are the urban problems related to energy? (4M)
- f) Write about ecotourism. (3M)

**PART -B**

2. a) Write about producers, consumers and decomposers (9M)
- b) Write in detail about aquatic ecosystem. (7M)
3. a) Write about world food problems and changes caused by modern agriculture. (8M)
- b) Write in detail about water logging and salinity. (8M)
4. a) What are the threats to biodiversity? (6M)
- b) Write about endangered and endemic species. (10M)
5. a) What are the causes, effects and control measures of air pollution? (12M)
- b) How is solid waste management done? (4M)
6. a) Write about forest conservation act. (8M)
- b) What is rain water harvesting? (8M)
7. a) Write about EIA,EMP and EIS (12M)
- b) Why public should have awareness about environment? (4M)

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**PART -A**

1. a) Write about Rio summit. (3M)
- b) What is the role of an individual in conservation of national resources? (4M)
- c) Write about species biodiversity. (4M)
- d) Write about soil pollution. (4M)
- e) What are environmental ethics. (3M)
- f) Write about environmental audit. (4M)

**PART -B**

2. a) Write about food chain, food webs and ecological pyramids (8M)
- b) Write the definition, scope and importance of environmental studies. (8M)
3. a) Write in detail about food resources. (8M)
- b) What are the advantages and disadvantages of construction of dams. (8M)
4. What are the causes, effects and control measures of noise pollution? (16M)
5. a) Write about water pollution act. (8M)
- b) What is resettlement and rehabilitation of people? (8M)
6. a) Write about hot spots of biodiversity? (8M)
- b) What is consumptive use and productive use of biodiversity? (8M)
7. Write a field report on the visit to a polluted metropolitan city. (16M)

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**PART -A**

1. a) Write about acid rains. (4M)
- b) Write about world food problems. (4M)
- c) Write about conservation of biodiversity. (3M)
- d) Write about solid waste management and its classification (4M)
- e) List out the different acts of environment. (3M)
- f) Write about EIA. (4M)

**PART -B**

2. a) What are the structure and function of an forest ecosystem? (8M)
- b) Write about global warming and climate change. (8M)
3. a) What is soil erosion? What is waste land reclamation? (8M)
- b) Write about the equitable use of resources for sustainable lifestyles. (8M)
4. a) What are the different values of biodiversity? (8M)
- b) Write about biodiversity at national and local levels. (8M)
5. a) What are the causes, effects and control measures of nuclear hazards? (10M)
- b) What are the effects of resettlements and rehabilitation? (6M)
6. Write about Air (prevention and control of pollution) act. (16M)
7. Write a field report on the visit to a polluted site. (16M)

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**II B. Tech II Semester Regular Examinations, April/May - 2016**  
**ELECTRONICS CIRCUIT ANALYSIS**  
 (Com. to ECE, EIE)

Time: 3 hours

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- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answer **ALL** the question in **Part-A**  
 3. Answer any **THREE** Questions from **Part-B**

**PART-A**

1. a) Write a short note on hybrid- $\pi$  capacitances.
- b) List the features of Darlington pair amplifier.
- c) Write advantages of negative feedback in amplifier?
- d) Classify different types of oscillator.
- e) What are the types of distortions possible in an amplifier.
- f) What is the importance of stagger tuning.

**PART-B**

2. a) Derive the equation for  $g_m$ , which gives relation between  $g_m$ ,  $I_C$  and temperature.
- b) Draw the equivalent circuit of hybrid-model and derive the expression for hybrid  $-\pi$  impedance in terms of low frequency h-parameters.
3. a) Draw the circuit diagram of cascade amplifier circuit and analyze its performance.
- b) Draw and explain the emitter coupled differential amplifier.
4. a) Give comparison of positive and negative feedback.
- b) Discuss the effect of negative feedback with respect to closed loop gain, bandwidth and distortion.
5. a) A phase shift oscillator is to be designed with FET having  $g_m = 5000\mu S$ ,  $r_d = 4k\Omega$  while the resistance in the feedback circuit is  $9.7k\Omega$ . Select the proper value of  $C$  and  $R_D$  to have the frequency of oscillations as  $5KHz$ .
- b) Perform the generalized analysis of LC oscillators with suitable block diagram and obtain the condition for Hartley and colpitt's oscillators.
6. a) Differentiate between push-pull and complementary symmetry configuration of a class B power amplifier.
- b) For a class B amplifier driven from a 24V power supply and driving a  $8\Omega$  load, compute i) Input d.c power, ii) output power, iii) conversion efficiency if the peak to peak output voltage across the load resistance is 22 Volts maximum.
7. a) Explain how the stagger-tuned design is superior to synchronously tuned design in the design of a multistage amplifier?
- b) Write about wideband amplifiers.

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**PART-A**

1. a) How Hybrid- $\pi$  parameters vary with temperature?  
 b) Write a note on difference amplifier.  
 c) Classify the amplifiers.  
 d) Explain the Barkhausen criterion in detail.  
 e) Write features of Power amplifiers.  
 f) Write advantage and disadvantage of tuned amplifier.

**PART-B**

2. a) Derive the expressions for the CE current gain and voltage gain including source resistance  $R_s$ .  
 b) Derive the expression for  $f_H$  and input admittance for emitter follower amplifier at high frequencies.
3. a) Draw the circuit diagram of a cascade amplifier and derive its overall voltage gain and impedance from its equivalent circuit.  
 b) Derive the expression for voltage gain and input impedance of bootstrap emitter follower amplifier.
4. a) Explain the method of analysis of feedback amplifier.  
 b) Calculate the voltage gain, input impedance and output impedance of a voltage series feedback amplifier having an open loop gain  $A=300$ ,  $R_i=1.5K\Omega$ ,  $R_o=50K\Omega$  and  $\beta=1/20$ .
5. a) Draw the diagram of Colpitt's oscillator and explain its working.  
 b) What are the factors that affects the frequency stability of an oscillator? How frequency stability can be improved in oscillators?
6. a) Derive the expression for efficiency of a direct coupled Class A power amplifier.  
 b) A single transistor operates as an ideal class B amplifier. If d.c current drawn from the supply is 25mA, calculate the a.c power delivered to load for load of  $2K\Omega$ .
7. a) Derive the expression for the gain of a single-tuned capacitance coupled amplifier, Discuss about its Selectivity .  
 b) Explain the Mismatching technique in tuned amplifiers.

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**PART-A**

1. a) Write about Gain-Bandwidth product.
- b) Explain the need of cascading amplifiers.
- c) Explain how the noise is reduced due to the negative feedback.
- d) Write advantages and disadvantages of wien bridge oscillator.
- e) What you meant by cross over distortion.
- f) Classify tuned amplifier.

**PART-B**

2. a) Draw the circuit diagram of cascade- transistor amplifier circuit and analyze its performance.
- b) Explain the differential mode and Common Mode operation of emitter coupled differential amplifier.
3. a) Draw the circuit diagram of Darlington pair circuit and derive its important characteristics.
- b) Compute the value of overall current gain and input impedance of a Darlington pair with  $1K\Omega$  emitter resistance connected to the emitter of a second transistor if  $h_{fc}$ ,  $h_{ic}$ ,  $h_{oc}$  and  $h_{rc}$  of both the transistor are given as - 51,  $1.1k\Omega$ , 0 and 1 respectively.
4. a) What are the different types of feedback amplifiers? Give their equivalent circuits.
- b) An amplifiers with negative feedback gives an output of 12.5 with an output of 1.5V. When feedback is removed, it requires 0.25V input for the same output. Find i) values of voltage gain without feedback. ii) value of  $\beta$ , if the input and output are in phase and  $\beta$  is real.
5. a) Calculate the value of 'C' in the frequency –determining network of a FET RC phase shift oscillator circuit having  $R=2.5K\Omega$ , assuming frequency of oscillation  $f=1.625KHz$ . Repeat same if it is BJT RC phase shift oscillation with  $R_C=4K\Omega$ .
- b) Draw the circuit of Hartley oscillator and explain its working .Derive the expressions for frequency of oscillation and condition for starting of oscillation.
6. a) Derive the expression for maximum value of conversion efficiency of class A power amplifier.
- b) Write a note on Heat sinks.
7. a) Draw the circuit diagram of a double –tuned circuit and explain its working and derive the expression for  $I_2$  max.
- b) What is the effect of cascading single tuned amplifier on bandwidth? Derive the expression for it.

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**PART-A**

1. a) Why h-parameter model is not suitable for high frequency analysis?  
 b) Write about CMRR.  
 c) Give characteristics of negative feedback amplifier.  
 d) Explain the principle of operation of oscillator.  
 e) Explain the term impedance matching.  
 f) Write about stability of tuned amplifiers.

**PART-B**

2. a) Draw the circuit for Darlington pair amplifier and derive the expressions for  $A_i$ ,  $A_v$ ,  $R_i$  And  $R_o$ .  
 b) Draw the circuit diagram of emitter coupled differential amplifier and obtain its d.c analysis.
3. a) Compare the three types of coupling methods used in multistage amplifiers.  
 b) Perform the analysis of boot – strapped emitter follower circuit.
4. a) Draw the circuit diagram of current shunt feedback and derive expressions for input and output resistance.  
 b) Explain the concept of feedback with block diagram.
5. a) Discuss and explain the basic circuit of an LC oscillator and derive the conditions for the oscillations.  
 b) A Hartley oscillator is to span a frequency range from 50KHz to 150KHz. The variable capacitance has the values in the range 50pF to 450pF. The transistor to be used as  $h_{fc}=50$  and  $\Delta h_e = 0.5$ . Determine the values of the inductances. Neglect mutual inductance between the coils and use CE circuit configuration.
6. a) A single transistor is operating as an ideal class B amplifier with a  $500\Omega$  load. A d.c meter in the collector circuit reads 10mA. How much signal power is derived to the load?  
 b) Draw a neat circuit diagram of push pull class B amplifier. Explain its working.
7. a) Explain the operation of a single tuned amplifier circuit and its frequency response.  
 b) Draw the circuit diagram of double tuned amplifier and simplify the same with its equivalent circuit.

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**PROBABILITY AND STATISTICS**  
 (Com. to CSE, IT, CHEM, PE, PCE)

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**PART -A**

1. a) Let the phase error in a tracking device have probability density (3M)  

$$F(x) = \begin{cases} \cos x & 0 < x < \frac{\pi}{2} \\ 0 & \text{elsewhere} \end{cases}$$
 find the probability that the error is between 0 and  $\frac{\pi}{4}$
- b) A random variable X has the discrete uniform distribution (3M)  
 $f(x, K) = \left\{ \frac{1}{K}, x = 1, 2, 3 \dots K \right.$  find the moment generating function of X
- c) A comparison of coffee prices at 4 randomly selected stores in San Diego showed (4M)  
 increases from the previous month of 12, 15, 17 and 20 cents for a one kilo bag.  
 Find the variance of this sample of price increases.
- d) Suppose that an allergist wishes to test the hypothesis that atleast 30% of the (4M)  
 public is allergic to some cheese products. Explain how the allergist could commit  
 i) A type 1 error ii) A type 2 error
- e) If  $n=50, \Sigma X = 75, \Sigma Y = 80, \Sigma X^2 = 130, \Sigma Y^2 = 140, \Sigma XY = 120$  , find the value (4M)  
 of the correlation coefficient r.
- f) Under what situations is a c-chart useful? (4M)

**PART -B**

2. a) Of a large group of men, 5% are under 60 inches in height and 40% are between (8M)  
 60 and 65 inches. Assuming normal distribution, find the mean and standard  
 deviation.
- b) Assume that 4 % of the population over 65 years has Alzheimer's disease. (8M)  
 Suppose a random sample of 9600 over 65 is taken. Find the probability p that  
 lower than 400 of them have the disease.
3. a) Find the moment generating function of the exponential distribution (8M)  
 $f(x) = \frac{1}{c} e^{-\frac{x}{c}}$   $0 \leq x \leq \infty, c > 0.$  Hence find its mean and standard  
 deviation.
- b) A lot containing 7 components is sampled by a quality inspector; the lot contains (8M)  
 4 good components and 3 defective components. A sample of 3 is taken by the  
 inspector. Find the expected value of the number of good components in this  
 sample.



4. a) If  $X$  is a binomial random variable, show that  $\hat{P} = \frac{X}{n}$  is an unbiased estimator of  $p$  (8M)
- b) A random sample of size  $n_1=25$ , taken from a normal population with a standard deviation  $\sigma_1 = 5$ , has a mean of  $\bar{x}_1=80$ . A second random sample of size  $n_2=36$ , taken from a different normal population with a standard deviation  $\sigma_2 = 3$ , has a mean of  $\bar{x}_2 = 75$ . Find a 95% confidence interval for the difference of the actual population means  $\mu_1 - \mu_2$ . (8M)
5. a) A manufacturer claims that the mean breaking strength of a cable is 8 kgs, with a standard deviation of 0.5 kg. Test the hypothesis that the mean  $\mu = 8$  kgs against  $\mu \neq 8$  if a random sample of 50 cables is tested and found to have a mean breaking strength of 7.8 kgs. Use a 0.01 level of significance. (8M)
- b) A manufacturer of a medicine claimed that it was 90% effective in relieving an allergy in 8 hours. In a sample of 200 people who had the allergy, the medicine provided relief for 160 people. Determine whether the manufacturer's claim is legitimate at a 0.01 level of significance. (8M)
6. a) Fit a second degree parabola to the following data using the method of least squares. (8M)
- |   |   |     |     |     |     |
|---|---|-----|-----|-----|-----|
| x | 0 | 1   | 2   | 3   | 4   |
| y | 1 | 1.8 | 1.3 | 2.5 | 6.3 |
- b) Obtain the line of regression of Y on X and estimate Y when X =55 from the following data (8M)
- |   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| X | 40 | 50 | 38 | 60 | 65 | 50 | 35 |
| Y | 38 | 60 | 55 | 70 | 60 | 48 | 30 |
7. a) 35 successive samples of 100 castings each, taken from a production line, contained respectively, 3, 3, 5, 3, 5, 0, 3, 2, 3,5,6,5, 9,1,2,4, 5,2,0,10,3, 6,3,2,5, 6, 3,3,2,5,1,0,7,4 and 3 defectives. If the fraction defective is to be maintained at 0.02, construct a p-chart for this data. (8M)
- b) The specification limits on a valve diameter (mm) are LSL (lower specification limit)=10.98, and USL (upper specification limit)=11.01. Measurements on 80 valves gave  $\bar{x} = 10.991$  and  $s = 0.0035$ . Estimate the process capability index  $C_p$ . (8M)



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**PART -A**

1. a) The mean of a Binomial distribution is 3 and variance is 9/4 find the probabilities (3M)  
 $P(X \geq 7), P(1 \leq X < 6)$
- b) If a Poisson variate X is such that  $P(x=1)=2P(x=2)$  find the mean and variance of X (4M)
- c) An electrical firm manufactures light bulbs whose length of life is approximately normally distributed, with mean 800 hours and standard deviation 40 hours. Find the probability that a random sample of 16 bulbs will have an average life of less than 775 hours. (3M)
- d) A sociologist is concerned about the effectiveness of a training course designed to get more drivers to use seat belts in cars. (4M)
  - i) What hypothesis is he testing if he commits a type one error
  - ii) What hypothesis is he testing if he commits a type two error
- e) Calculate the correlation coefficient between X and Y series from the following data: (4M)

	X series	Y series
No. of items	15	15
Arithmetic Mean	25	18
Sum of squares of deviations from the mean	136	138

Sum of the product of deviations of X and Y from their respective means =122

- f) What are change variation and assignable variation? (4M)

**PART -B**

2. a) In a lottery there are 200 prizes of Rs.5, 20 prizes of Rs.25, and 5 prizes of Rs.100. Assuming that 10,000 tickets are to be issued and sold, what is a fair price to pay for a ticket? (8M)
- b) In a certain city the daily consumption of water (in millions of litres) which follows a Gamma distribution with  $\lambda = 2$  and  $a = \frac{1}{3}$  of the daily capacity of that city is 9 million litres of water, what is the probability that on any given day the water supply is inadequate? (8M)
3. a) The probability distribution of a discrete random variable X is (8M)  
 $f(x) = \binom{3}{x} \left(\frac{1}{4}\right)^x \left(\frac{3}{4}\right)^{3-x}, x = 1,2,3$ . Find the mean of X.
- b) Derive the moment generating function of the Poisson distribution. (8M)



4. a) Travelling between two campuses of a university in a city via buses takes, on average 28 minutes with a standard deviation of 5 minutes. In a given week a bus transported passengers 40 times. What is the probability that the average transport time is more than 30 minutes?( Assume that the mean is measured to the nearest minute.) (8M)
- b) A machine produces metal pieces that are cylindrical in shape. A sample of pieces is taken and the diameters are found to be 1.01, 0.97, 1.03, 1.04, 0.99, 0.98, 0.99, 1.01 and 1.03 cm. Find a 99% confidence interval for the mean diameter of pieces from the machine, assuming an approximately normal distribution. (8M)
5. a) A random sample of 100 recorded deaths in a country showed an average life span of 71.8 years. Assuming a population standard deviation of 8.9 years, does this seem to indicate that the mean life span today is greater than 70 years? Use a 0.05 level of significance. (8M)
- b) Of the two salesmen, X claims that he has made more sales than Y. For the accounts examined, which were comparable for the two salesmen, the following results were obtained. (8M)

	X	Y
Number of sales	10	17
Average size of sales	Rs.6200	Rs.5600
Standard Deviation of Sales	Rs.690	Rs.600

Do these two “average size of sales” differ significantly (5% level of significance)

6. a) Fit an exponential curve of the form  $y = ab^x$  to the following data (8M)
- |   |   |     |     |     |     |     |     |     |
|---|---|-----|-----|-----|-----|-----|-----|-----|
| x | 1 | 2   | 3   | 4   | 5   | 6   | 7   | 8   |
| y | 1 | 1.2 | 1.8 | 2.5 | 3.6 | 4.7 | 6.6 | 9.1 |
- b) Calculate the regression coefficients of Y on X and X on Y from the following data:  $\Sigma X = 50, \Sigma Y = 60, \Sigma XY = 350, \bar{x} = 5, \bar{y} = 6, \sigma_x^2 = 4, \sigma_y^2 = 9$  (8M)
7. a) A machine is set to deliver packets of a given weight. 10 samples of size 5 each were recorded. Below is given the relevant data: (8M)
- |           |   |   |   |   |   |   |    |   |    |    |
|-----------|---|---|---|---|---|---|----|---|----|----|
| Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7  | 8 | 9  | 10 |
| Range     | 7 | 7 | 4 | 9 | 8 | 7 | 12 | 4 | 11 | 5  |
- Draw the R-chart and comment on its state of control
- b) A drilling machine bores holes with a mean diameter of 0.5230cm. With a standard deviation of 0.0032 cm. Calculate the 2-sigma and 3-sigma upper and lower control limits for the mean s of samples 4 and draw the control chart. (8M)



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**PART -A**

1. a) Out of 800 families with 5 children each, how many would expect to have (3M)  
 i) 3 boys  
 ii) At least one boy
- b) Let  $X$  be a random variable with density function (4M)  

$$f(x) = \begin{cases} \frac{x^2}{3} & -1 < x < 2 \\ 0 & elsewhere \end{cases}$$
 Find the expected value of  $g(X) = 4X + 3$
- c) A certain type of thread is manufactured with a mean tensile strength of 78.3 (3M)  
 kilograms and standard deviation of 5.6 kilograms. How is the variance of the sample mean changed when the sample size is increased from 64 to 196?
- d) The mean score for students on an aptitude test at a certain college is 540, with a (4M)  
 standard deviation of 50. What is the probability that two groups selected at random, consisting of 32 and 50 students respectively will differ in their mean scores by more than 20 points
- e) Prove that the correlation coefficient is independent of change of scale (4M)
- f) Discuss the conditions for a process to be not in the state of control (4M)

**PART -B**

2. a) In testing a certain truck tyre over a rugged terrain, it is found that 25% of the (8M)  
 trucks fail to complete the test run without a blowout and of the next 15 trucks tested, find the probability that  
 i) from 3 to 6 have blowouts  
 ii) Fewer than 4 have blowouts.  
 iii) More than 5 have blowouts.
- b) A random sample of size 100 is taken from an infinite population with mean (8M)  
 $\mu = 76$  and variance  $\sigma^2 = 256$ . what is the probability that the random variable  $x$  will lie between 75 and 78?
3. Find the first four moments of the Binomial Distribution. (16M)



4. a) The following table gives the number of aircraft accidents that occur during various days of the week. Find whether the accidents are uniformly distributed over the week. (Level of significance 5%) (8M)

Days of the week	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Number of accidents	14	16	8	12	11	9	14

- b) The average zinc concentration recovered from a sample of measurements taken in 36 different locations in a river is found to be 2.6 gms. per ml. Find the 95% and 99% confidence intervals for the mean zinc concentration in the river. Assume that the population standard deviation is 0.3 gm per ml. (8M)
5. a) It is claimed that a vacuum cleaner uses an average of 46 kilowatt hours per year. If a random sample of 12 homes indicates that the vacuum cleaners use an average of 42 kilowatt hours per year with a standard deviation of 11.9 kilowatt hours, does this suggest at 0.05 level of significance that vacuum cleaners use on average less than 46 kilowatt hours annually ( assume that the population of kilowatt hours is normal) (8M)
- b) Can the following samples be regarded as coming from the same normal populations? (8M)

Sample	Size	Sample Mean	Sum of squares of deviations from the mean
1	10	12	120
2	12	15	314

6. a) Fit a straight line to the following data (8M)

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

- b) The correlation coefficient between two variables X and Y is  $r = 0.6$ . (8M)  
If  $\sigma_x = 1.50$ ,  $\sigma_y = 2.00$ ,  $\bar{x} = 10$  and  $\bar{y} = 20$ , find the regression lines of  
i) Y on X ii) X on Y
7. a) A plastics manufacturer makes blanks for use in the manufacture of eye-glass temples. Specifications require that the thickness of these blanks have  $\bar{x} = 0.150$  inch and  $\sigma = 0.002$  inch. Calculate a 2-sigma and 3-sigma upper and lower control limits of samples 5 in number and prepare a control chart (8M)
- b) Based on 15 subgroups each of size 200 taken at intervals of 45 minutes from a manufacturing process, the average fraction defective was found to be 0.068. Calculate the value of the central line and upper and lower control limits. (8M)



**II B. Tech II Semester Regular Examinations, April/May – 2016**  
**PROBABILITY AND STATISTICS**  
 (Com. to CSE, IT, CHEM, PE, PCE)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answer **ALL** the question in **Part-A**  
 3. Answer any **THREE** Questions from **Part-B**
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**PART -A**

1. a) The mean intelligence quotient (I.Q.) of a large number of children of age 14 was 100 and the standard deviation 16. Assuming that the deviation is normal find the percentage of children with I.Q. under 80. (3M)
- b) Let  $X$  be a random variable with density function (4M)
 
$$f(x) = \begin{cases} \frac{x^2}{3} & -1 < x < 2 \\ 0 & elsewhere \end{cases}$$
 Find the variance of  $g(X) = 4X + 3$
- c) Find the variance of the data 3,4,5,6,6 and 7 representing the number of fish caught by a random sample of 6 fishermen on a particular day. (3M)
- d) A sample of size 400 was drawn and the sample mean was found to be 99. Test whether this sample could have come from a normal population with mean 100 and variance 64 at 5% level of significance. (4M)
- e) Find the value of the coefficient of correlation of two independent variables. (4M)
- f) What is the control charts used for measurements? (4M)

**PART -B**

2. a) Suppose that the lifetime of a certain kind of an emergency backup battery (in hours) is a random variable  $X$  with the Weibull distribution, with  $\alpha = 0.1$  and  $\beta = 0.5$ . find i) The mean lifetime of these batteries. ii) The probability that such a battery will last more than 300 hours. (8M)
- b) If a car agency sells 50% of its inventory of a certain foreign car equipped with side airbags, find a formula for the probability distribution of the number of cars with side airbags among the next 4 cars sold by the agency. (8M)
3. a) Find the moment generating function of the Binomial distribution about the origin. (8M)
- b) A continuous random variable  $X$  has the density function (8M)
 
$$f(x) = \begin{cases} e^{-x}, & x > 0 \\ 0, & elsewhere \end{cases}$$
 Find the expected value of  $g(X) = e^{\frac{2X}{3}}$
4. a) A certain machine makes electrical resistors having a mean resistance of 40 ohms and a standard deviation of 2 ohms. What is the probability that a random sample of 36 of these resistors will have a combined resistance of more than 1458 ohms? (8M)
- b) In a random sample of  $n=500$  families owning television sets in a city A, it is found that 340 families subscribe to the HBO channel. Find a 95% confidence interval for the actual proportion of families with television sets in this city that subscribe to HBO. (8M)



5. a) Consider the following measurements of the heat producing capacity of coal (8M)  
produced by two mines

Mine 1	8260	8130	8350	8070	8340	
Mine 2	7950	7890	7900	8140	7920	7840

Can it be concluded that the two population variances are equal?

- b) 200 digits are chosen at random from a set of tables. The frequencies of the digits (8M)  
are as follows:

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	18	19	23	21	16	25	22	20	21	15

Use the  $\chi^2$  test to assess the correctness of the hypothesis that the digits were distributed in equal numbers in the tables from which they were chosen.

6. a) Fit a second degree parabola  $y = a + bx + cx^2$  to the following data (8M)

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

- b) Obtain the rank correlation from the following data (8M)

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

7. a) Construct an  $\bar{x}$  chart for the following data. (8M)

Sample number	Observations		
1	32	36	42
2	28	32	40
3	39	52	28
4	50	42	31
5	42	45	34
6	50	29	21
7	44	52	35
8	22	35	44

Determine whether the process is in control

- b) If the average fraction defective of a large sample of products is 0.1537, calculate (8M)  
the control limits



**II B. Tech II Semester Supplementary Examinations, April/May - 2016**

**MECHANICS OF SOLIDS**

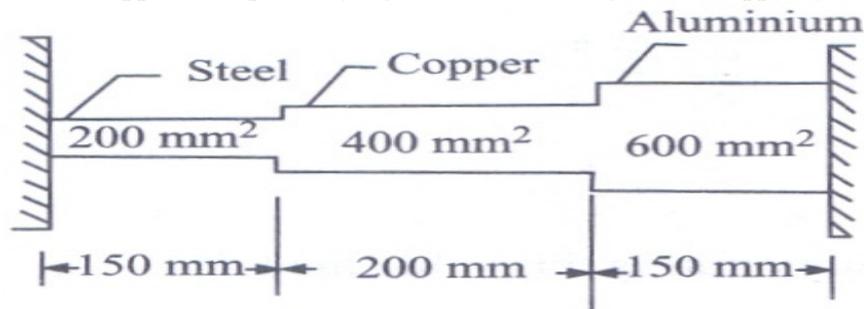
(Com. to ME, AME, MM)

Time: 3 hours

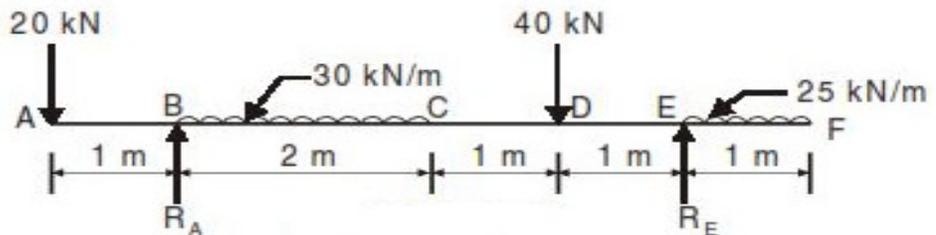
Max. Marks: 75

Answer any **FIVE** Questions  
All Questions carry **Equal** Marks

1. a) A rod is composed of three segments as shown in Fig. the rod is held between rigid supports. Find the stress developed in each material when the temperature of the system is raised by  $50^{\circ}\text{C}$  under the following two different conditions.  
(i) When the supports are perfectly rigid (ii) when the right hand support yields by 0.2 mm



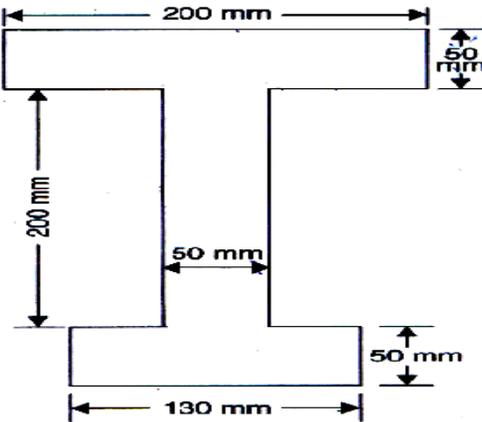
- b) A piece of material is subjected to three mutually perpendicular tensile stresses and the strains in the three directions are in the ratio 3:4:5. If the value of Poisson's ratio is 0.2857, find the ratio of the stresses and their values when the greatest stress is  $90\text{N/mm}^2$ . (7M+8M)
2. a) A simply supported beam ABC of 10m span is supported at A and B, A and B being 8m apart. The beam carries a load of 4kN at a distance of 6m from A and another of the same magnitude at the right end. A counter clock wise couple of 8kNm also acts at a distance of 3m from A. Draw the shear force and bending moment diagrams indicating principal values.  
b) Draw the shear force and bending moment diagrams for given figure. (8M+7M)



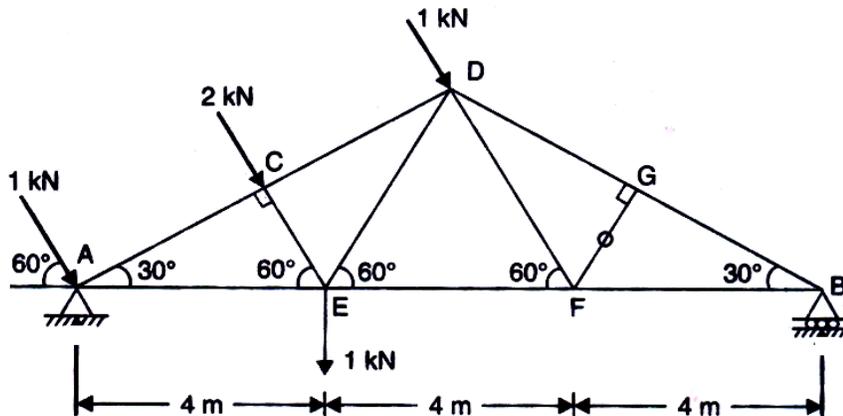
3. a) Derive the expression for the bending stress  $M/I = \sigma/y = E/R$ .  
b) A beam is simply supported and carries a U.D.L of  $40\text{kN/m}$  run over the whole span. The section of the beam is rectangular having depth as  $500\text{mm}$ . If the maximum stress in the material of the beam is  $120\text{N/mm}^2$  and moment of inertia of the section is  $7 \times 10^8 \text{mm}^4$ , find the span of the beam. (10M+5M)



4. a) The shear force acting on the beam at an I-section with unequal flanges is 50kN. The section is shown in figure i) the moment of inertia of a section about N.A is  $2.849 \times 10^4$ . Calculate the shear stress at the N.A. and also draw the shear stress distribution over the depth of the section.



- b) A rectangular beam of 200mm deep and 300mm wide is simply supported over a span of 8m. What uniformly distributed Load per meter the beam may carry, if the bending stress is not to exceed  $120 \text{ N/mm}^2$ . (9M+6M)
5. Determine the forces in the truss shown in below figure which is subjected to inclined loads. (15M)



6. Find the deflection and slope of a beam subjected to uniform bending moment. (15M)
7. a) Derive the expression of hoop stress for thin spherical shell.  
b) Derive expression for circumferential strain, volumetric strain for thin spherical shell. (6M+9M)
8. a) A thick cylindrical pipe of internal radius 120mm and external radius 160mm is subjected to an internal fluid pressure of  $12 \text{ N/mm}^2$ . Determine the hoop stress in the cross-section. What is the percentage error if the maximum hoop stress is found from the equation for thin pipes?  
b) Derive the Lamé's equations for thick cylindrical shell. (8M+7M)



**II B. Tech II Semester Supplementary Examinations, April/May - 2016**  
**ELECTRONIC CIRCUIT ANALYSIS**

(Com. to ECE, EIE)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions  
 All Questions carry **Equal** Marks

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1. a) Give the complete low frequency small signal analysis of CB Amplifier (8M)  
 b) A transistor with  $h_{fe} = 60$ ,  $h_{ie} = 1.15 \text{ K}$ ,  $h_{oe} = 26 \text{ micro amps/ Volt}$  and  $h_{re} = 2.4 \times 10^{-4}$  is connected in CE configuration. Find its Input impedance, Voltage gain, Current gain and output impedance (7M)
2. a) Draw the current shunt feedback amplifiers with discrete components and derive for its gain, input impedance and output impedance (8M)  
 b) An amplifier requires an input signal of 60 mV to produce a certain output. With negative feedback to get the same output, the required input signal is 0.5V. The voltage gain with feedback is 90. Find the open loop gain and feedback factor. (7M)
3. a) What is the condition for oscillations? Discuss (6M)  
 b) Draw the RC-phase shift oscillator and derive expression for oscillations (9M)
4. a) Give the complete analysis of direct coupled amplifiers (8M)  
 b) Discuss the choice of transistor configuration in cascade amplifiers (7M)
5. a) Draw the CE hybrid-  $\pi$  model and derive for all hybrid-  $\pi$  conductances (9M)  
 b) Derive expression for any hybrid-  $\pi$  capacitance (6M)
6. a) Draw the class-A power amplifier and show that the conversion efficiency can be improved with Transformer coupling from 25% to 50%. (8M)  
 b) In a class A amplifier,  $V_{CE(max)} = 15\text{V}$ ,  $V_{CE(min)} = 1\text{V}$ . Find the overall efficiency for (i) series-fed load (ii) transformer fed load (7M)
7. a) Draw the double tuned amplifier and give its complete analysis (7M)  
 b) Draw the class C tuned amplifier and explain its working (8M)
8. Write short notes on the following (15M)
  - (a) Shunt regulators
  - (b) Overload voltage protection

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