G 6824 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fourth Semester

Branch : Electronics and Communication/Applied Electronics and Instrumentation/ Electronics and Instrumentation Engineering

DIGITAL ELECTRONICS AND LOGIC DESIGN (LAS)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. State and prove De Morgan's theorems.
2. What is meant by wire – ANDing ? How it is done ?
3. Using 4 :1 MUX, construct :
   (i) OR.
   (ii) NAND functions.
4. Simplify using K-map $f = \Sigma m\,(0,1,2,4,6,8,10,14)$.
5. Implement a half adder using basic gates and show the implementation of full adder using two half adders.
6. Subtract $(12)_{10}$ from $(15)_{10}$ using BCD code.
7. Justify the use of (i) negative (ii) edge triggered clocks in TTL flip flops.
8. Suggest two distinct methods of eliminating race around conditions, bringing out their merits and demerits.
9. Draw a mod-3 counter, and explain its working with the help of timing diagram.
10. Show how can you use a ring counter to get a gate waveform.

(10 × 4 = 40 marks)

Turn over

Part B

Answer **either** *Section* (a) **or** (b) *from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) Draw and explain the working of a CMOS inverter and describe its working with the help of truth table. Explain the propagation delay, power dissipation, fan-in and fan-out for CMOS logic of family.

Or

(b) (i) With the help of circuit diagram, explain the operation of tristate logic ? (6 marks)

(ii) Describe the features of the 7400 TTL sub families. (6 marks)

(12 marks)

Module 2

12. (a) Minimise the function $f = \Sigma m(1,3,5,8,9,11,15) + d(2,13)$ and realise the minimal circuit using NAND gates.

(12 marks)

Or

(b) Implement the following using multiplexer : —

(i) $f_1 = \Sigma m(0,2,4,6,9,11,13,15) + d(5,7,8,12)$ (6 marks)

(ii) $f_2 = \pi M(1,5,6,7,11,12,13,15)$ (6 marks)

Module 3

13. (a) Draw and explain the block circuit diagram of a one-digit BCD adder. (12 marks)

Or

(b) Draw the truth table of a full subtractor and using K maps, realise the minimal circuit using basic logic gates.

(12 marks)

Module 4

14. (a) Draw the truth tables of SR and JK flip flops. Account for the differences and explain how the JK flip-flop overcomes the drawbacks of SR. Explain with their logic circuits drawn using NAND gates only.

(12 marks)

Or

(b) What is a latch ? Explain D-latch with its circuit drawn using fundamental gates. Explain two distinct applications of the D flip flop.

(12 marks)

Module 5

15. (a) Using K-maps, and excitation table, design a mod-10 gray code up counter.

(12 marks)

Or

(b) Draw the circuit diagram of a static RAM cell using transistors and explain its working. Explain how the memory read and write operations are accomplished ?

(12 marks)

[5 × 12 = 60 marks]

G 6820 (Pages : 3) Reg. No ECE

Name .....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fourth Semester

ENGINEERING MATHEMATICS—III (CMELRPTANSUF)

(Regular/Improvement/Supplementary)

(Common for all Branches)

Time : Three Hours Maximum : 100 Marks

Answer **one** *full question from each module.*
Statistical tables permitted.

Module I

1. (a) Solve $\left(1+y^2\right)dx = \left(\tan^{-1}y - x\right)dy$. (7 marks)

(b) Solve $(D^2 - 2D + 1)y = e^x \log x$ by the method of variation of parameters. (9 marks)

(c) Solve $y' + y \tan x = y^3 \sec x$. (4 marks)

Or

(d) Solve $\left[\left(1+\frac{1}{x}\right)y + \cos y\right]dx + [x + \log x - x \sin y]dy = 0$. (5 marks)

(e) Solve $\left(D^2 - 3D + 2\right)y = x^2 + e^x$. (7 marks)

(f) Using method of variation of parameters, solve $\frac{d^2y}{dx^2} + 4y = \tan 2x$. (8 marks)

Module II

2. (a) If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$. (7 marks)

(b) Using Lagrange's undetermined multipliers find the maximum value of $x^2 + y^2 + z^2$ subject to $ax + by + cz = p$. (8 marks)

(c) Solve by Cherpit's method $(p^2 + q^2)y = qz$. (5 marks)

Or

(d) The two ends A and B of a rod 30 cm. long have the temperature at 40° C and 90° C until steady state prevails. The temperatures of the ends are changed to 50° C and 70° C respectively. Find the temperature distribution in the rod at time t. (20 marks)

Turn over

Module III

3. (a) Define Fourier transform of a function $f(x)$. Show that $F[f(x-\alpha)] = e^{i\alpha a} F(\alpha)$, where $F(\alpha)$ is the Fourier transform of $f(x)$.

(5 marks)

(b) Find the Fourier cosine transform of the function $f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0, & x > a \end{cases}$. (7 marks)

(c) Verify the Parseval's identity for the function $f(x) = \begin{cases} 1, & \text{for } |x| \leq a \\ 0, & \text{for } |x| > a \end{cases}$. (8 marks)

Or

(d) Find the Fourier transform of : $f(x) = \begin{cases} 1 - x^2, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$ (5 marks)

(e) Find the Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$, $a > 0, x \neq 0$ and hence show that $\int_0^\infty \tan^{-1}\left(\frac{x}{a}\right)(\sin x)dx = \frac{\pi}{2}e^{-a}$.

(8 marks)

(f) State and prove the convolution theorem for Fourier transforms. (7 marks)

Module IV

4. (a) If a random variable X has a Poisson distribution with parameter α, then prove that $E(x) = \alpha$, and $V(x) = \alpha$.

(5 marks)

(b) The probability that a patient recovers from a disease is 0.4. If 18 persons have such a disease, determine the probability that :

(i) exactly 6 survive.

(ii) at least 10 survive.

(iii) from 3 to 9 survive.

(10 marks)

(c) If X has normal distribution with mean m and variance s^2, find $P[\mu - \sigma < X < \mu + \sigma]$.

(5 marks)

Or

(d) Small electric motors are shipped in lots of 50. Before such a shipment is accepted, an inspector chooses 5 of these motors and inspects them. If none of these tested motors are defective, the lot is accepted. If one or more are found to be defective, the entire shipment is inspected. Suppose that there are, in fact, three defective motors in the lot, what is the probability that 100 % inspection is required ?

(10 marks)

(e) Suppose that the probability that an item produced by a particular machine is defective equal 0.2. If 10 items produced from this machine are selected at random, what is the probability that not more than one defective is found ?

(6 marks)

(f) Find the probability that 5 out of 10 persons are in favour of a given pirce of legislation given tha the sample is taken from 100 persons among whom 60 are for it.

(4 marks)

Module V

5. (a) Let $\bar{X}$ be the mean of a random sample of size "n" from a distribution which is N (μ, 9). Find n such that $P[\bar{X} - 1 < \mu < \bar{X} + 1] = 0.90$.

(10 marks)

(b) A set of five similar coins is tossed 320 times and the result is :

No. of heads	:	0	1	2	3	4	5
Frequency	:	6	25	74	110	73	32

Test the hypothesis that the data follow a binomial distribution at 0.05 level of significance.

(10 marks)

Or

(c) Fit a Poisson distribution to the following data and test for its goodness of fit at level of significance 0.05.

x	:	0	1	2	3	4
f	:	419	342	164	54	21

(10 marks)

(d) The voltage of a voltage source is measured 100 times and the mean voltage is found to be 230.14 V, with a standard deviation of 0.6 V. Test the hypothesis that the mean voltage of the source is 230 V at 0.05 level of significance.

[5 × 20 = 100 marks]

G 6834 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fourth Semester

Branch : Electronics and Communication/Applied Electronics and Instrumentation/ Electronics and Instrumentation Engineering

COMMUNICATION ENGINEERING – I (L A S)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Compare and contrast the modulation indices of AM and FM?
2. When the modulating frequency in an FM system is 500 Hz and the modulating voltage is 2 V, the modulation index is 50. Calculate the maximum deviation.
3. What is pre-emphasis? Why it is done?
4. Explain the basic principle of a reactance modulator.
5. Distinguish between sensitivity and selectivity of a radioreceiver.
6. What is delayed AGC? How it works?
7. Explain Lincompex. Could it be used with any form of SSB?
8. Where do you prefer VSB signals to SSB? Why?
9. List the four standard tones used by the BSNL landline telephone system.
10. What is the function of Modem used in a Fax machine?

(10 × 4 = 40 marks)

Part B

Answer **either** *Section (a)* **or** *(b) of each module.*
Each full question carries 12 *marks.*

MODULE 1

11. (a) Draw the frequency spectrum of the FM channel centered on 99.9 MHz, showing all the relevant frequencies. Draw the frequency spectrum showing details of the three lowest frequency channels and the three highest frequency channels and determine the bandwidth.

Or

(b) (i) Derive the expression for the total power in DSB-FC.

(ii) An ordinary AM broadcast transmitter radiates 9 kw with the carrier unmodulated and 10.125 kw when the carrier is sinusoidally modulated. Calculate the modulation index. If another sine wave, corresponding to 50% modulation. is transmitted simultaneously, determine the total radiated power.

(4 + 8 = 12 marks)

MODULE 2

12. (a) (i) Discuss the merits and demerits of solid state modulators compared to the tube types.

(ii) The collector modulated classic transistor amplifier may experience a great difficulty. What is this difficulty? How this can be solved? Show with a circuit diagram, one of the solutions to this problem.

(4 + 8 = 12 marks)

(b) Draw the circuit diagram of a transistor reactance modulator and explain how FM is generated. Compare the performance of this circuit with the Armstrong modulator.

(12 marks)

MODULE 3

13. (a) (i) Explain how the use of an RF amplifier improves the SNR of a superheterodyne receiver.

(ii) With the help of a neat circuit diagram, explain the operation of the practical diode detector, indicating what changes have been made from the basic circuit? How is AGC signal obtained from this circuit?

(4 + 8 = 12 marks)

Or

(b) Draw the practical circuit of a balanced ratio detector and show how it is derived from the basic circuit. Explain the improvement effected by each of the stages. What are the demerits of this practical circuit?

(12 marks)

MODULE 4

14. (a) Show mathematically what happens when two frequencies are added and amplified through the non-linear portion of a transistor? List and draw at least two circuits which make use of this.

Or

(b) Draw the block diagram of a phase cancellation SSB generator and explain how the carrier and unwanted side band are suppressed. What change is necessary to suppress the other side band?

(12 marks)

MODULE 5

15. (a) Draw the standard telephone circuit diagram showing connection to the central exchange and describe each component and its functions. How DTMF works?

Or

(b) With the help of a clear block diagram, explain how power line communication takes place between two substrations. What are the precautions taken?

(12 marks)

[5 × 12 = 60 marks]

G 6844 **(Pages : 3)** **Reg. No.....**

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fourth Semester

Branch—Electronics and Communication/Applied Electronics and Instrumentation/Electronics and Instrumentation Engineering

ELECTRONIC CIRCUITS—II (L A S)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. What is Base spreading resistance ? Why it is considered during high frequency operation ?
2. What is multistage amplifier ? What are its merits and demerits ?
3. An Emitter follower has a voltage gain less than unity, yet it is used in Electronic circuits. Why ? Justify your answer with an example.
4. Differentiate between positive and negative feedbacks ?
5. Can every electronic oscillator be considered as an amplifier with an infinite gain ? Where from the starting signal voltage come ? Explain.
6. Why do you use three RC sections in an RC phase-shift oscillator ? What is its transfer ratio at the oscillation frequency ?
7. Which multivibrator is known as flip flop ? Why it is called so ?
8. How does a Schmitt trigger differ from a bistable multivibrator ?
9. Explain with the help of equations, why even harmonics are not present in the output of a transformer coupled push-pull amplifier circuit.
10. Give any *four* distinct practical applications of the time base generators.

(10 × 4 = 40 marks)

Part B

Answer **either** *section* (*a*) **or** (*b*) *of each module.*
Each full question carries 12 *marks.*

MODULE 1

11. (a) Draw the hybrid π high frequency model of a CE transistor and compute all the hybrid π parameters, given the low frequency parameters at I_C = 10 mA, V_{CE} = 10 V, h_{ie} = 500Ω, $h_{oe} = 10^{-5}\ \upsilon$, $h_{re} = 10^{-4}$, h_{fe} = 100, f_T = 50 MHz, C_c = 3 pF, C_e = 100 pF.

(12 marks)

Or

Turn over

(b) (i) What is series resonance ? Develop expressions for frequency of resonance, Q factor of coil and voltage magnification.

(6 marks)

(ii) Explain the merits and demerits of double tuned amplifier circuits over single tuned ones.

(6 marks)

MODULE 2

12. (a) Draw a circuit example of a voltage shunt negative feedback amplifier and analyse this feedback amplifier to derive the gains with feedback, R_{if} and R_{of}.

(12 marks)

Or

(b) For the feedback amplifier shown below (fig. 1), calculate : (i) voltage gain, (ii) feedback factor : (iii) input resistance with feedback and (iv) output resistance with feedback.

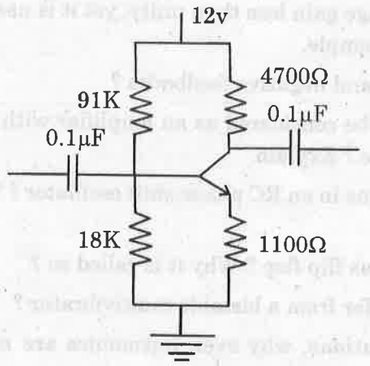

Fig.1.

(12 marks)

MODULE 3

13. (a) Draw and explain the circuit of a wien bridge oscillator using BJT. Derive the expression for frequency of oscillation. Will oscillations take place if the bridge is balanced ? Explain.

(12 marks)

Or

(b) Draw the circuit of a Colpitts oscillator and design it to generate 100 kHz sine wave. How the frequency can be varied ± 50 kHz about the above oscillating frequency ?

(12 marks)

MODULE 4

14. (a) With a circuit diagram and necessary waveforms, describe the working of a self-biased monostable multivibrator ? Derive expression for its output pulse width ?

(12 marks)

Or

(b) Draw the circuit of a transistor Schmitt trigger and explain the working. Design the circuit for LTP = 2 volt, UTP = 4 volt.

(12 marks)

MODULE 5

15. (a) Describe the circuit of a tuned class C power amplifier and explain its working. Explain why such a circuit is suitable for operation at a single high frequency only and not suitable for audio frequency amplification. Explain the operating characteristics of such an amplifier.

(12 marks)

Or

(b) With a neat circuit diagram and related waveforms, explain how linear sweep can be generated using Miller sweep generator.

(12 marks)

[5 × 12 = 60 marks]

(b) (i) Determine ROC of the signals, using Laplace Transform method :

(i) $x_1(t) = \left[e^{-2t} u(t) \right] + \left[e^{-t} u(-t) \right]$

(ii) $x_2(t) = \left[e^{-t} u(t) \right] + \left[e^{-2t} u(-t) \right]$.

(6 marks)

(ii) From the definition of Z-transform, find the Z-transform of $x(n) = \sinh(w_0 n)$ for $n \geq 0$.

(6 marks)

MODULE 5

15. (a) (i) The probability density function is given by $f_x(x) = \alpha e^{-b|x|}$ where X is a random variable whose values lie in the range $x = -\infty$ to $x = +\infty$. Determine the relationship between α and β.

(6 marks)

(ii) A random variable X has the uniform distribution given by :

$$f_x(x) = \begin{cases} \frac{1}{2\pi} & \text{for } 0 \leq x \leq 2\pi \\ 0 & \text{otherwise} \end{cases}$$

Determine m_x, $\overline{X}^2$.

(6 marks)

Or

(b) The marginal probability density functions of two random variable X and Y are :

$$f_x(x) = \begin{cases} 5(1-x)^2 & \text{for } 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

$$f_y(y) = \begin{cases} 5(1-y)^2 & \text{for } 0 \leq y \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Determine :

(i) Mean of random variables X and Y.

(ii) Variance of random variables X and Y.

(6 + 6 = 12 marks)

[5 × 12 = 60 marks]

G 6854 **(Pages : 4)** **Reg. No.....**

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fourth Semester

Branches—Electronics and Communication/Applied Electronics and Instrumentation/ Electronics and Instrumentation/Information Technology

SIGNALS AND SYSTEMS (LAS T)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Missing data can be suitably assumed.

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Explain Causality and stability of a system with suitable examples.
2. How do you define 'time-invariance' property of a continuous-time system ? Give examples of a time-varying continuous time and discrete time systems.
3. Using duality theorem, find the fourier Transform of $x(t) = \frac{1}{1+t^2}$.
4. Use Parseval's theorem to calculate the energy in the signal $x(t) = 4 \sin c\ 40t$.
5. Clearly explain the relationship between Z-transform and DTFT of a sequence.
6. Can FFT be used for evaluating IDFT ? Why ?
7. Find the Laplace Transform and the associated region of convergence of $e^{-at} \cos wt$.
8. Determine $x(n)$, $n \geq 0$, if its unilateral Z-transform is $X(z) = \frac{5}{z^2 - 0.25z}$.
9. Define cross correlation and autocorrelation and write the relevant expressions.
10. State the properties of a random variable.

(10 × 4 = 40 marks)

Turn over

Part B

Answer **either** *section* (*a*) **or** (*b*) *of each module.*
Each full question carries 12 *marks.*

MODULE 1

11. (a) A system is described by the difference equation $2y(n) = y(n-1) + 2x(n) + x(n-1)$.

(i) What is its unit sample response sequence ? (2 marks)

(ii) Determine and sketch its frequency response. (5 marks)

(iii) What is the response to the input $x(n) = \cos\left[\frac{n\pi}{2} + \frac{\pi}{3}\right], -\infty < n < \infty$? (5 marks)

Or

(b) Check whether each of the following systems is linear, shift-invariant, causal and BIBO stable (if linear and shift-invariant) :—

(i) $y(n) = x(n) - x(n-2) - 6y(n-2)$. (6 marks)

(ii) $y(n) = x(n) - nx(n-1)$. (6 marks)

MODULE 2

12. (a) (i) State and prove the convolution and modulation properties of Fourier series. (6 marks)

(ii) Compute the Fourier transform and draw the spectrum for the rectangular pulse shown in Fig.1.

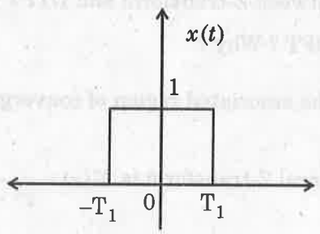

Fig.1.

(6 marks)

Or

(b) (i) Find the frequency response of a continuous time LTI system represented by the impulse response $h(t) = e^{-|t|}$.

(6 marks)

(ii) Using partial fraction expansion, determine the inverse fourier transform of :

$$X(jw) = \frac{5jw + 12}{(jw)^2 + 5jw + 6}.$$

(6 marks)

MODULE 3

13. (a) Find the DTFS of the following signal and draw the magnitude and phase spectra (Fig.2).

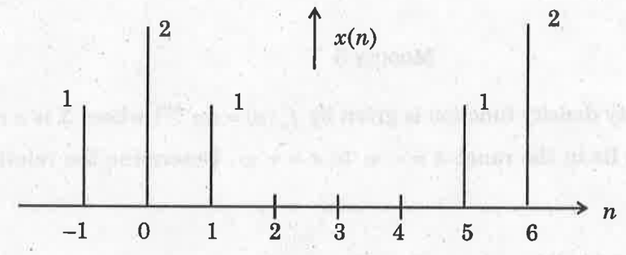

Fig.2.

(12 marks)

Or

(b) Find the DTFT of :

$$x(n) = \begin{cases} 1, & |n| \le M \\ 0, & |n| > M \end{cases}.$$

Plot magnitude and phase spectra.

(12 marks)

MODULE 4

14. (a) (i) Explain the linearity and shifting properties of Z-transform. (4 marks)

(ii) A linear time-invariant system is characterised by system function :

$$H(z) = \frac{3 - 4z^{-1}}{1 - \frac{7}{2}z^{-1} + \frac{3}{2}z^{-1}}.$$

Specify the ROC of H(z) and determine $h(n)$ for the following conditions :—

(i) System is stable.

(ii) System is causal.

(8 marks)

Or

G 6862 **(Pages : 3)** **Reg. No.....**

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fourth Semester

Branches : Electronics and Communication, Applied Electronics and Instrumentation, Electronics and Instrumentation Engineering

RELIABILITY AND HUMANITIES (LAS)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Use of Statistical tables permitted.

Answer **all** *questions.*

Each question carries 20 marks.

MODULE 1

1. (a) Define :
   (i) Active redundancy.
   (ii) Corrective maintenance.
   (iii) Down time.
   (iv) Maintainability.

(8 marks)

(b) In a survival test conducted on 100 cardboard boxes for their strength under impact loading, the following results were obtained :

Number of impacts	:	20	22	24	26	29	32	35	37	40
Number of boxes failed	:	7	10	15	14	15	13	13	8	3

Define failure density, failure rate and probability. Tabulate these quantities and represent them graphically.

(12 marks)

Or

(c) A bowl contains 50 capacitors out of which 10 are defective :
   (i) What is the probability of drawing a defective capacitor from the bowl ?
   (ii) What is the probability of drawing two good capacitors from the bowl ? State the assumptions made.

(5 + 5 = 10 marks)

(d) In a full wave bridge rectifier circuit with four identical diodes, having the failure probabilities q_s (short – mode) = 0.25, q_o (open – mode) = 0.15. If the reliability of the transformer is 0.98, calculate the reliability of the rectifier circuit.

Turn over

(10 marks)

MODULE 2

2. (a) Define and explain the following :

(i) system mean time to failure. (ii) system unavailability.

(iii) system hazard rate. (iv) partial active redundancy.

(v) standby system.

(b) Prove that the hazard model of a system having m components in parallel and each component with a constant failure rate can be approximated to a Weibull model.

(10 + 10 = 20 marks)

Or

(c) Compare graphically the reliabilities of the following systems for $p = 0.9$ and $p = 0.8$, where p is the reliability of each component :

(i) Four – component parallel system.

(ii) 2 out of 4 system.

(iii) 3 out of 4 system.

(iv) four component series system.

(d) It is found that the random variations with respect to time in the output voltage of a particular system are exponentially distributed with a mean value of 100 V. What is the probability that the output voltage will be found at any time to lie in the range 90–110 V.

(10 + 10 = 20 marks)

MODULE 3

3. (a) Define quality control. Compare and contrast between reliability and quality control.

(b) What is redundancy ? What are the different types of redundancy ? How reliability is evaluated in a parallel system ?

(10 + 10 = 20 marks)

Or

(c) Explain different costs of quality ?

(d) Describe the role and objectives of quality standards ?

(10 + 10 = 20 marks)

MODULE 4

4. (a) The tensile strength of a metal structure is normally distributed and 30 samples of size $n = 6$ are collected over a period of time with the following results :

$\sum\bar{X} = 6000$ and $\sum R = 150$

(i) Calculate control limits for $\bar{X}$ and R charts.

(ii) Both charts exhibit control. The specification limits are 200 ± 5. Comment on the process capability ratio.

(b) What do you mean by attribute data and variable ?

(15 + 5 = 20 marks)

Or

(c) Distinguish between R chart and C charts ?

(d) Explain the significance of high spots and low spots in a P-chart.

(10 + 10 = 20 marks)

MODULE 5

5. (a) Define industrial fatigue ? What are the methods to overcome ?

(b) Explain the role of industrial tribunals to deal with disputes ?

(10 + 10 = 20 marks)

Or

(c) What are the fields which workers can participate and contribute in management ?

(d) Describe different types of wages, incentives and other allowances existing in industries.

(10 + 10 = 20 marks)

[5 × 20 = 100 marks]