# POST GRADUATE COMMON ENTRANCE TEST-2016

| DATE and TIME | COURSE | SUBJECT |
|---|---|---|
| 03-07-2016<br>2.30 p.m. to 4.30 p.m. | ME/M.Tech/M.Arch/<br>courses offered by<br>VTU/UVCE/UBDTCE | ELECTRICAL SCIENCES<br>(E&E/E&C/TC/BME&ME/IT) |

| MAXIMUM MARKS | TOTAL DURATION | MAXIMUM TIME FOR ANSWERING |
|---|---|---|
| 100 | 150 Minutes | 120 Minutes |

| MENTION YOUR PGCET NO. | | | | | QUESTION BOOKLET DETAILS | |
|---|---|---|---|---|---|---|
| | | | | | VERSION CODE | SERIAL NUMBER |
| | | | | | D - 1 | 211000 |

**DOs :**

1. Check whether the PGCET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. Ensure whether the circles corresponding to course and the specific branch have been shaded on the OMR answer sheet.
3. This Question Booklet is issued to you by the invigilator after the **2nd Bell i.e., after 2.25 p.m.**
4. The Serial Number of this question booklet should be entered and the respective circles should also be shaded completely on the OMR answer sheet.
5. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely on the OMR answer sheet.
6. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

**DON'Ts :**

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. **The 3rd Bell rings at 2.30 p.m., till then;**
   - Do not remove the paper seal / polythene bag of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

## IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 75 (items) questions and each question will have one statement and four answers. (Four different options / responses.)
2. After the **3rd Bell is rung at 2.30 p.m.,** remove the paper seal / polythene bag of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 120 minutes:
   - Read each question (item) carefully.
   - Choose one correct answer from out of the four available responses (options / choices) given under each question / item. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **only one response** for each item.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :

(A) ● (C) (D)

4. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
5. After the **last Bell is rung at 4.30 pm,** stop marking on the OMR answer sheet and affix your **left hand thumb impression** on the OMR answer sheet as per the instructions.
6. Handover the **OMR ANSWER SHEET** to the room invigilator as it is.
7. After separating the top sheet (KEA copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
8. Preserve the replica of the OMR answer sheet for a minimum period of **ONE year**.
9. Only **Non-programmable** calculators are allowed.

**Marks Distribution**

PART-A : (Section 1) 30 Questions : 30 X 1 = 30 (Section 2) 15 Questions : 15 X 2 = 30
PART-B : (Section 1) 20 Questions : 20 X 1 = 20 (Section 2) 10 Questions : 10 X 2 = 20

(Common to E & E / E & C / TC / BME & ME / IT)

## PART – A

## (SECTION – I)

**Each question carries one mark.** **(30 × 1 = 30)**

1. An 8 bit DAC produces an output voltage of 2V for input code of 0110, 0100 the resolution of the DAC is
   (A) 0.1% (B) 0.3%
   (C) 0.2% (D) 0.4%

2. If stability error for step input and speed of response be the criteria for design, the suitable controller will be
   (A) P controller
   (B) PI controller
   (C) PD controller
   (D) PID controller

3. A 4 bit modulo – 6 ripple counter uses JK flip – flop if the propagation delay of each FF is 50 ns, the maximum clock frequency that can be used is equal to
   (A) 5 MHz (B) 10 MHz
   (C) 4 MHz (D) 20 MHz

4. An 8085 μp based system drives a multi placed 5 digits 7 segment display. The digits are referred at a rate of 500 Hz, the ON time for each digit is
   (A) 4 ms (B) 0.4 ms
   (C) 10 ms (D) 25 ms

5. Both RAM and ROM are examples of _____ access memories.
   (A) Read (B) Write
   (C) Random (D) None of these

6. The eigen values of the matrix $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ $0 < \theta < \pi/2$ are
   (A) Real
   (B) Imaginary
   (C) Purely imaginary
   (D) None of these

7. If $A = \begin{bmatrix} 0.5 & 0 & 0 \\ 0 & -4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then the eigen values of $A^{-1}$ are
   (A) 0.5, −4, 1 (B) 2, −0.25, 1
   (C) 0.3, 2, 1 (D) 0, 0, 2

8. $\lim_{x \to 0} \left(\frac{a^x + b^x}{2}\right)^{\frac{1}{x}}$ is equal to
   (A) $-\sqrt{ab}$ (B) $a\sqrt{b}$
   (C) $\sqrt{ab}$ (D) $\sqrt{a^2 b}$

9. For a vector function $\vec{F}$, $div\,\vec{F} = 0$ then $\vec{F}$ is called
   (A) Irrotational (B) Conservative
   (C) Solenoidal (D) Rotational

10. Transitor's α and β are related by
    (A) $\beta = \frac{\alpha}{1-\alpha}$ (B) $\alpha = \frac{\beta}{1-\beta}$
    (C) $\beta = \frac{\alpha}{1+\alpha}$ (D) $\alpha = \frac{1+\beta}{\beta}$

**Space For Rough Work**

11. The emitter follower configuration is an example of

(A) voltage series feedback

(B) current series feedback

(C) current shunt feedback

(D) voltage shunt feedback

12. Maximum theoretical conversion efficiency of a transformer coupled class-A amplifier is

(A) 25% (B) 50%

(C) 75% (D) 100%

13. In a Wein bridge oscillator frequency of oscillation is given by

(A) $f = \frac{1}{2\pi RC}$ (B) $f = \frac{1}{RC}$

(C) $f = \frac{1}{2\pi\sqrt{6}\,RC}$ (D) $f = \frac{1}{2\pi\sqrt{3}\,RC}$

14. In integrator circuit is also a _____ circuit.

(A) high pass (B) low pass

(C) band pass (D) band reject

15. A positive NAND becomes a negative

(A) AND (B) NOR

(C) OR (D) None of these

16. Minimum number of a flip-flops needed to construct a decade counter

(A) 4 (B) 3

(C) 10 (D) None of these

17. Subtracting $(3)_8$ from $(100)_8$ yields

(A) 75 (B) 97

(C) 86 (D) 50

18. A 16k RAM can store a maximum of

(A) 16384 bytes of information

(B) 16000 bytes of information

(C) 16535 bytes of information

(D) None of these

19. A data selector is also called a

(A) Demultiplex

(B) Priority encoder

(C) Multiplexer

(D) Decoder

20. A half adder can be constructed using two (2) input logic gates, one of them is the AND gate and the other is _____ gate.

(A) OR (B) NAND

(C) NOR (D) EX-OR

**Space For Rough Work**

21. One of the fallowing methods can be used to determine the absolute stability of a control system :
(A) Routh stability criterion
(B) Roof locus technique
(C) Nyquist criterion
(D) Bode plots

22. Determine the gain and phase margin for a system with the open loop transfer function given by
(A) $\infty$, 30°
(B) 0, 60°
(C) $\infty$, 60°
(D) 0, 30°

23. A cross complier is used to
(A) Convert high level language code to assembler code.
(B) Convert one high level language to a different high level language.
(C) Complier code for a target CPU that is different from the development CPU.
(D) Combine both high level language & assembler into a single module.

24. For a 2 part symmetrical bilateral network, if transmission parameters A = 3 and B = 1 Ω, the value of parameter 'C' is
(A) 3
(B) 8S
(C) 8 Ω
(D) 9

25. The current through an 4H inductor is given by $I_L$ (S) = 10 / S (S + 2). The initial voltage across inductor is
(A) 40V
(B) 20V
(C) 10V
(D) 5V

26. Performance of one of the following diodes is not based upon its negative resistance characteristics :
(A) Gunn
(B) IMPATT
(C) Tunnel
(D) Backward

27. The logic family that has the highest noise immunity of the following :
(A) CMOS
(B) TTL
(C) ECL
(D) DTL

28. Negative feedback in amplifiers leads to
(A) Build up oscillations
(B) Reduced voltage gain
(C) De-stabilisation of voltage gain
(D) Increased voltage gain

29. The law that defines the polarity of induced EMF in a coil is known as
(A) Lenz law
(B) Faraday's law
(C) Cock screw rule
(D) Fleming's law

30. An amplifiers power level is changed from 8 watts to 16 watts equivalent dB given
(A) 2 dB
(B) 3 dB
(C) 6 dB
(D) 5 dB

**Space For Rough Work**

## (SECTION – II)

**Each question carries two marks.** **(15 × 2 = 30)**

**31.** The number of branch in a network is b, the number of nodes is n and the number of dependent loop is $l$, then the number of independent node equation will be

(A) $n + l - 1$ (B) $b - 1$
(C) $b - n + 1$ (D) $n - 1$

**32.** IGBT stands for

(A) Insulated Gate Bipolar Transistor
(B) Insulated Gate Base Transistor
(C) Integrated Gate Bipolar Transistor
(D) None of the above

**33.** The state space representation of a system is given by

$x(t) = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(t), y(t) = [1\ 1]\, x(t)$ The transfer function for this system is

(A) $(S^2 + 3S + 2)^{-1}$
(B) $(S + 2)^{-1}$
(C) $S(S^2 + 3S + 2)^{-1}$
(D) $(S + 1)^{-1}$

**34.** Stability of a control system can be determined from one of the following responses :

(A) Ramp response
(B) Step response
(C) Impulse response
(D) None of the above

**35.** $L[e^{-t} \sinh t] =$

(A) $\frac{1}{(s+1)^2+1}$ (B) $\frac{1}{(s-1)^2+1}$
(C) $\frac{1}{s(s+2)}$ (D) $\frac{s-1}{(s-1)^2+1}$

**36.** The equation $a_0 x^2 y'' + a_1 xy' + a_2 y = f(x)$ is called

(A) Legendre's linear equation
(B) Cauchy's linear equation
(C) Simultaneous equation
(D) Method of undetermined co-efficient

**37.** If P(B) = 0.81 and P(A ∩ B) = 0.18 then P(A / B) =

(A) 0.22 (B) 0.32
(C) 0.42 (D) 0.31

**38.** The lower 3 dB frequency and upper 3 dB frequency of a CE amplifier stage with a mid band gain of 40 dB are 100 Hz and 100 kHz respectively, what is the amplifier gain at 100 Hz and 100 kHz ?

(A) 35 dB (B) 50 dB
(C) 37 dB (D) 25 dB

**Space For Rough Work**

39. According to Barkhussain criterion for oscillations to occur

(A) Loop gain ≥ 1, Loop phase shift = 0°

(B) Loop gain ≥ 1, Loop phase shift = 180°

(C) Loop gain ≤ 1, Loop phase shift = 0°

(D) Loop gain ≤ 1, Loop phase shift = 180°

40. For RC low pass circuit if R = 1kΩ, C = 0.01Mf and step input 10V, what time will the out rise from 1V to 9V ?

(A) 10μs (B) 1μs

(C) 20μs (D) 22μs

41. The average conversion time in a 4-bit successive approximation type A/D convertor run by a 1 MHz clock could be

(A) 4 μs (B) 8 μs

(C) 16 μs (D) 1 μs

42. A JK flip-flop has all its inputs like J, K, PR, CLR, as active low inputs for the flip-flop to work synchronously

(A) PR = CLR = 0

(B) PR = CLR = 1

(C) PR = 0, CLR = 1

(D) PR = 1, CLR = 0

43. The transfer function of a feedback control system having a gain factor of 10, zeros at (–1) and (–3) and poles at (–2) and (– 4) is

(A) $\frac{10(S+1)(S+3)}{(S+2)(S+4)}$

(B) $\frac{10(S+1)(S+4)}{(S+1)(S+3)}$

(C) $\frac{10(S-1)(S-3)}{(S-2)(S-4)}$

(D) $\frac{10}{(S+1)(S+2)(S+3)(S+4)}$

44. Consider the following instruction :

```
MVI A,A9H
MVI B,57H
ADD B
ORA A
```

The flag status (s, z, cy) after the instruction ORA A is executed is

(A) (0,1,1) (B) (0,1,0)

(C) (1,0,0) (D) (1,0,1)

45. Consider the fallowing 8035 assembly program :

```
MVI B,894
MOV A,B
MOV C,A
MOV D,37H
OUT PORT1
HLT
```

The output at PORT1 is

(A) 89

(B) 37

(C) 00

(D) None of the above

**Space For Rough Work**

**Note : Please choose to answer Part-B below corresponding to your basic degree.**

## (E & E : ELECTRICAL AND ELECTRONICS ENGINEERING)

## PART – B

## (SECTION – I)

**Each question carries one mark.** **(20 × 1 = 20)**

**46.** A distance relay is said to be inherently directional if its characteristics on R-X diagram is

(A) A straight line of set from the origin

(B) Circle that passes through the origin

(C) Circle that encloses the origin

(D) Always a separate directional relay is required.

**47.** Corona loss increases with

(A) Increase in supply frequency and conductor size

(B) Increase in supply frequency but reduction in conductor size

(C) Decrease in supply frequency and conductor size

(D) Decrease in supply frequency but increase in conductor size

**48.** Steady state stability of a power system is improved by

(A) Reducing fault clearing time

(B) Using double circuit line instead of single circuit line

(C) Single pole switching

(D) Decreasing generator inertia

**49.** The following sequence currents are recorded in a power system under a fault condition :

$I_{positive}$ = j1.653pu; $I_{negative}$ = –j0.5pu; $I_{zero}$ = –j1.153pu

The fault is

(A) Line to ground

(B) Three phase

(C) Double line to ground

(D) Line to line

**50.** String efficiency can be improved by

(A) Using long cross arm

(B) Grading the insulator

(C) Using a guard ring

(D) Any of these

**51.** EMF equation of a DC generator is

(A) $E = \emptyset \frac{ZN}{60} P/A^2$ (B) $E = \emptyset \frac{ZN}{70} P/A$

(C) $E = \emptyset \frac{ZN}{60} P/A$ (D) $E = \emptyset \frac{Z}{60} P/A$

**52.** The Armature winding in a DC machine has

(A) More number of turns than the field winding

(B) Equal number of turns as that of field winding

(C) Less number of turns than the field winding

(D) None of the above

**Space For Rough Work**

53. The torque equation of a DC motor is
(A) $T = \Phi I_a NP/A$
(B) $T = 0.159\Phi ZI_a P/A$
(C) $T = 0.159\Phi ZP/A$
(D) $T = 0.159\Phi ZI_a$

54. DC series machine is
(A) Self excited
(B) Separately excited
(C) Unexcited
(D) None

55. The no lead current of a transformer in terms of full load current is usually
(A) 3% to 15% (B) 1% to 3%
(C) 9% to 12% (D) 12% to 15%

56. The regulation of a transformer for a capacitive load is
(A) +ve (B) (–ve)
(C) Zero (D) ∞

57. All day efficiency is always calculated for
(A) Distribution transformer
(B) Power transformer
(C) Instrument transformer
(D) All of these

58. The low power factor of an induction motor is due to
(A) Rotor leakage reactance
(B) Stator reactance
(C) Reactive lagging magnetizing current
(D) All of these

59. Which of the following statement is not valid when a squirrel cage induction motor operates under no load ?
(A) Rotor induced emf is low.
(B) Rotor current is low.
(C) Power factor is low.
(D) Slip is low.

60. Daper winding on alternator results in all of the following, except :
(A) Increases instability of machine
(B) Elimination of harmonic effects
(C) Absorption of energy of oscillations
(D) Suppression of spontaneous hunting

61. The speed of an alternator is changed from 3000 rpm to 1500 rpm. The generated emf/ph will become
(A) One fourth (B) Half
(C) Double (D) Unchanged

62. The speed of the synchronous motor
(A) Increases with increase in load
(B) Decreases as load increase
(C) Varies with power factor
(D) Always remain constant

63. In load how studies, bus classification is based on which of the following variables ?
(A) Magnitude of bus voltage
(B) Phase angle of Bus voltage
(C) Active and reactive power
(D) All of these

64. Transmission lines are transposed to
(A) Reduce transmission loss
(B) Reduce skin effects
(C) Reduce conductor vibrations
(D) Reduce interference with neighbouring communication lines

65. In a high head hydro electric power plant, surge tank is provided to
(A) Reduce the length of the penstock
(B) Augment water at the fore bay
(C) Control pressure variations in the penstock
(D) Control of water flow through turbine

**Space For Rough Work**

## (SECTION – II)

**Each question carries two marks.** **(10 × 2 = 20)**

**66.** If the fault current is 2 kA, the relay setting is 50% and CT ratio is 400/5, then the plug setting multiplier of a relay will be

(A) 5 (B) 7
(C) 8 (D) 10

**67.** The insulation resistance of a cable of length 10 km is 1MΩ its resistance for 50 km length will be

(A) 1MΩ (B) 5MΩ
(C) 0.2MΩ (D) None

**68.** When a line to ground fault occurs, the currents in a faulted phase is 100A. The zero sequence current in this case will be

(A) Zero (B) 33.3A
(C) 66.6A (D) 100A

**69.** If the voltage regulation of s transformer is 2%,

(A) Voltage drop is 2%
(B) Voltage rise is 2%
(C) Voltage drop is 0%
(D) Voltage drop is 75%

**70.** 400 V, 8 kW ph syn. motor has negligible resistance and syn. reactance of 8.

The minimum current at full load condition is

(A) 13.12A (B) 15A
(C) 10A (D) 12A

**71.** A 3300/300 V 1ph 300 kVA transformer has 1100 primagations. The transformation ratio is

(A) $\frac{1}{11}$ (B) $\frac{1}{10}$
(C) $\frac{11}{10}$ (D) 1

**72.** For a 3 ph, 4 pole, 50 Hz induction mirror running at 1440 rpm, the slip is

(A) 0.1 (B) 0.04
(C) 0.05 (D) 0.06

**73.** The condition for max torque of an induction motor is

(A) $S = \frac{R_2}{x_{2.0}}$ (B) $S = \frac{x_{2.0}}{R_2}$
(C) $S = X_{2.0}$ (D) $S = R_2$

**74.** The synchronous reactance $X_s$ in an alternator is

(A) $X_s = X_a + X_L$
(B) $X_s = X_a - X_L$
(C) $X_s = \frac{X_a}{X_L}$
(D) $X_s = \frac{X}{X_a}$

**75.** A 60 Hz 320 km loss less time has sending end voltage 1.0 pu, the receiving end voltage on no load is

(A) 1.1 pu (B) 1.088 pu
(C) 1.116 pu (D) None

**Space For Rough Work**

## (E & C AND TC : ELECTRONICS AND COMMUNICATION ENGINEERING AND TELECOMMUNICATION ENGINEERING)

## PART - B

## (SECTION – I)

**Each question carries one mark.** **(20 × 1 = 20)**

**46.** An N – channel enhancement MOSFET is usually in the OFF state and can be turned ON by applying on

(A) Appropriate positive voltage at the gate

(B) Appropriate negative voltage at the gate

(C) Appropriate voltage at the gate

(D) None of these

**47.** VLSI stands for

(A) Very Large Scale Integration

(B) Large Scale Integration

(C) Volt Large Scale Integrator

(D) None of the above

**48.** MSP 430 is _____ IC.

(A) Microprocessor

(B) Microcontroller

(C) Translators

(D) None of these

**49.** CISC is an acronym for

(A) Complex Instruction Set Code

(B) Complex In Set Code

(C) Complex Into System Code

(D) None of the above

**50.** Consider a discrete time periodic signal x [n] = $\begin{cases} 1, 0 \le n \le 7 \\ 0, 8 \le n \le 9 \end{cases}$ with period N = 10, also y [n] = x [n] – x [n – 1]. The fundamental period y [n] is

(A) 9

(B) 10

(C) 11

(D) None of the above

**51.** An antenna behaves as a resonant circuit only when its length is

(A) $\frac{\lambda}{2}$ or its integral multiple

(B) $\frac{\lambda}{4}$

(C) $\frac{\lambda}{8}$

(D) None of these

**Space For Rough Work**

52. A transmission line having a reflection co-efficient of $\frac{1}{3}$ when terminated in a certain load, its SWR is

(A) 2 (B) $\frac{1}{2}$

(C) 3 (D) 5

53. The dominant mode is rectangular wave guides is the

(A) $TE_{10}$ mode (B) $TM_{01}$ mode

(C) $TM_{11}$ mode (D) $TM_{10}$ mode

54. If it takes a transmitted signal 1m sec to go up to the target and comeback after reflection, how far from the transmitter the target is

(A) 100 km (B) 200 km

(C) 150 km (D) 75 km

55. If the highest modulation frequency is 5 kHz, find out bandwidth.

(A) 5 kHz (B) 10 kHz

(C) 2.5 kHz (D) 705 kHz

56. A Deemphasis circuit is used

(A) After Demodulation

(B) Prior to demodulation

(C) To emphasis the magnitude of low frequency components

(D) To boost the magnitude of high frequency components

57. A device that is used to detect objects under water is known as

(A) Radar

(B) Sonar

(C) MTI

(D) Pulse comparison radar

58. In a PCM system if the codeword length is increased from 6 to 8 bits the signal to quantization noise ratio improves by the factor

(A) $\frac{8}{6}$ (B) 12

(C) 16 (D) 8

59. A BPSK scheme operating over an AWGN channel with noise power spectral density of $N_o/2$, uses equiprobable signals $S_1 = \sqrt{2E/T}\sin(w_c t)$ and $S_2 = -\sqrt{2E/T}\sin(w_c t)$ over the symbol interval (0, T) if the local oscillator in a coherent receiver is ahead in phase by 45° with respect to the received signal. The probability of error in the resulting system

(A) $Q(\sqrt{\frac{2E}{N_o}})$ (B) $Q(\sqrt{\frac{E}{N_o}})$

(C) $Q(\sqrt{\frac{E}{2N_o}})$ (D) $Q(\sqrt{\frac{E}{4N_o}})$

**Space For Rough Work**

60. The input x(t) and y(t) of a system are related as $y(t) = \int_{-x}^{t} x\tau \cos(3\tau)\, d\tau$ The system is

(A) Time invariant and stable

(B) Stable and not time invariant

(C) Not time invariant and not stable

(D) Time invariant and not stable

61. Given that $W=e^{i(\frac{2\pi}{N})}$ where N = 3 then $F = W^N$ can be computed as F =

(A) 0 (B) 1

(C) –1 (D) E

62. Determine whether the following signal is periodic or not :

$X(t) = \cos\pi/4t + \sin\pi/3t$

(A) Periodic

(B) Non-periodic

(C) Both (A) and (B)

(D) None of these

63. Let y(N) denote the convolution of h(n) and g(n) where $h(n) = (1/2)^n u(n)$ and g(n) is a casual sequence, if y(0)=1 and y(1)=1/2 then g(1) equals

(A) 0 (B) 1/2

(C) 1 (D) 3/2

64. Radio link is an example of

(A) Wireless circuit

(B) Wired circuit

(C) Optical fiber

(D) Microwave link

65. The DC to DC converter that is referred to as constant power output converter is the

(A) Push – pull converter

(B) Ringing choke type converter

(C) Half, bridge converter

(D) Full bridge converter

Space For Rough Work

## (SECTION – II)

**Each question carries two marks.** **(10 × 2 = 20)**

**66.** Silicon dioxide layer is used in IC chips for

(A) Providing mechanical strength

(B) Diffusing elements

(C) Providing contacts

(D) Providing mark against diffusion

**67.** PSK, BPSK and QPSK are types of _____ modulation techniques.

(A) Analog

(B) Digital

(C) Analog and Digital

(D) None of the above

**68.** Determine the discrete time fourier transform of the given signal $x[n] = \begin{cases} 1, & |n| \le 2 \\ 0, & \text{otherwise} \end{cases}$

(A) $\frac{\sin 5\Omega}{\sin \Omega}$

(B) $\frac{\sin 4\Omega}{\sin \Omega}$

(C) $\frac{\sin 25\Omega}{\sin \Omega}$

(D) None of the above

**69.** An antenna is radiating 100 watts and is drawing 2A from the transmitter its radiation resistance is

(A) 100 Ω

(B) 50 Ω

(C) 25 Ω

(D) 75 Ω

**70.** In a pulse radar, the peak transmitted power is increased by a factor of 81, keeping the other parameters unchanged, the maximum range capability of the radar increases by a factor of

(A) 3

(B) 9

(C) 81

(D) 27

**Space For Rough Work**

71. The reflection coefficient (ρ) is expressed in terms of ($Z_L$) and ($Z_0$) as

(A) $|\rho| = \left|\frac{Z_L - Z_0}{Z_L + Z_0}\right|$

(B) $|\rho| = \left|\frac{Z_L + Z_0}{Z_L - Z_0}\right|$

(C) $|\rho| = \left|\frac{VSWR+1}{VSWR-1}\right|$

(D) $|\rho| = \left|\frac{Z_L}{Z_0}\right|$

72. The bandwidth of DSB suppressed carrier modulation system when the modulation frequency varies between 100 Hz and 5 kHz is

(A) 10 Hz

(B) 20 kHz

(C) 4.9 kHz

(D) 10 kHz

73. What is the bandwidth of an FM signal generated by a modulation frequency of 2 kHz and a maximum deviation of 16 kHz ?

(A) 32 kHz

(B) 16 kHz

(C) 2 kHz

(D) 8 kHz

74. If Z – transform is given by x (2) = cos ($2^{-3}$), |2| > 0, the value of x[12] is

(A) – 1/24

(B) 1/24

(C) – 1/6

(D) 1/6

75. A radar system that can determine both target range as well as target velocity is

(A) Pulsed radar

(B) Doppler radar

(C) CW radar

(D) MTI

**Space For Rough Work**

## (BME & ME : BIOMEDICAL ENGINEERING & MEDICAL ELECTRONICS)

## PART – B

## (SECTION – I)

**Each question carries one mark.** **(20 × 1 = 20)**

**46.** A real time QRS detection algorithm developed by

(A) Hamilton and Tompkins

(B) Pan and Tompkins

(C) Pan and Hamilton

(D) None of these

**47.** The saturation component in HIS color model is

(A) 1 – 3/(R+G+B)[min(R,G,B)]

(B) 1 – 3/(R+G+B)[max(R,G,B)]

(C) 1/3(R+G+B)

(D) (R+G+B)

**48.** The net result of simultaneous dynamic range compression and contrast enhancement can be achieved by performing

(A) highboost filtering

(B) contrast stretching

(C) homomorphic filtering

(D) low pass filtering

**49.** The detection of an isolated point in an image at the location on which the mask is centered if [R-response of the mask at any point in the image, T-non negative threshold]

(A) $|R| \geq T$

(B) $|R| \leq T$

(C) $|R| = T$

(D) None of these

**50.** The sobel operator mask used in image processing along the x-direction is

(A) $\begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$

(B) $\begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix}$

(D) $\begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$

**Space For Rough Work**

51. The blood pressure measurement usually performed by a doctor using the cuff and stethoscope is
(A) Ultrasound
(B) Oscillometric
(C) Auscultatory
(D) Pulse transit time

52. The type of pacemaker that generates electrical impulses when the patients heart rate falls below a predetermined rate is called
(A) A demand pacemaker
(B) Asynchronous pacemaker
(C) Repolarization pacemaker
(D) A non-demand pacemaker

53. Which of the following are the stages of respiration in the correct order ?
(A) Gaseous transport, breathing, tissue respiration and cellular respiration
(B) Breathing, gaseous transport, tissue respiration and cellular respiration
(C) Breathing, gaseous transport, cellular respiration and tissue respiration
(D) Breathing, tissue respiration, cellular respiration and gaseous transport

54. Volume of air that can be taken in and expelled out by maximum inspiration is
(A) lung capacity
(B) vital capacity
(C) tidal volume
(D) respiratory volume

55. The X-ray intensity is generally lesser towards the direction
(A) anode
(B) cathode
(C) the source
(D) None of these

56. Static mode and dynamic mode are available with
(A) A-scan
(B) B-scan
(C) C-scan
(D) M-scan

57. Speckles are seen in ultrasound images due to the following phenomena of the echoes :
(A) reflection
(B) refraction
(C) diffraction
(D) interference

**Space For Rough Work**

58. Brownian motion refers to _____ motion of the molecules.

(A) external

(B) angular

(C) internal

(D) planar

59. Sinusoidal signal $x(t) = 4 \cos (200t + \pi/6)$ is passed through a square law device defined by the input-output relation $y(t) = x^2(t)$. The DC component in the signal is

(A) 3.46

(B) 4

(C) 2.83

(D) 8

60. Energy of the signal $A\ \delta[n]$ is

(A) $A^2$

(B) $A^2/2$

(C) $A^2/4$

(D) 0

61. X-rays and Gamma rays are a form of

(A) Light

(B) Particle radiation

(C) Electromagnetic radiation

(D) Cosmic radiation

62. Periodic function of half wave symmetry is necessarily

(A) an even function

(B) an odd function

(C) neither odd nor even

(D) both odd and even

63. Averaging 64 responses will improve the signal to noise ratio by what factor ?

(A) 64

(B) 32

(C) 16

(D) 8

64. If the output sequence of a digital filter is {1,0,0,2,0,1} in response to a unit impulse, then the transfer function of this filter $H(z)=Y(z)/X(z)$ is

(A) $1 + z^{-3} + z^{-5}$

(B) $1 + 2z^{-3} + z^{-5}$

(C) $1 + z^{-3} + 2z^{-5}$

(D) $2z^{-3} + z^{-5}$

65. Turning point algorithm is one of _____ algorithm.

(A) lossless

(B) lossy

(C) neither lossless nor lossy

(D) None of these

**Space For Rough Work**

## (SECTION – II)

**Each question carries two marks.** **(10 × 2 = 20)**

**66.** IIR filters are
(A) non-recursive type
(B) recursive type
(C) neither recursive nor non-recursive
(D) None of these

**67.** If compression ratio is 2.63 the relative redundancy is
(A) 0.62
(B) 0.38
(C) 2.63
(D) None of these

**68.** Smoothing and sharpening frequency domain filters are basically
(A) HPF, LPF (B) LPF, HPF
(C) BPF, LPF (D) BEF, BPF

**69.** An LVDT has linearity of 0.005%. It is linear upto a displacement of ±5 mm. It has
(A) an infinite resolution and high sensitivity of the order of 40 V.mm
(B) good frequency response
(C) no effect due to stray magnetic fields
(D) None of these

**70.** What is the cardiac output when 10 mg of indicator was injected and average concentration as calculated from curve was 5 mg/l for a duration of 20 sec ?
(A) 4 L/min (B) 5 L/min
(C) 6 L/min (D) None of these

**71.** Quantum noise is seen when the X-ray dose is
(A) less
(B) more
(C) at the upper limit
(D) affecting the tissues

**72.** The melting point of tungsten is
(A) 337 °C (B) 33700 °C
(C) 3370 °C (D) 337000 °C

**73.** The Fourier transform of the exponential signal $e^{j\omega_0 t}$ is
(A) a constant
(B) a rectangular gate
(C) an impulse
(D) a series of impulses

**74.** When x[n]={1,2,3,4,5}, h[n]={1} then x[n]*h[n] is
(A) {1,3,6,10,15} (B) 1,2,3,4,5}
(C) {1,4,9,16,20} (D) {1,4,6,8,10}

**75.** Number of butterflies needed for entire computation for N=16 is
(A) 8 (B) 16
(C) 32 (D) 64

**Space For Rough Work**

## (IT : INSTRUMENTATION TECHNOLOGY)

## PART – B

## (SECTION – I)

**Each question carries one mark.** **(20 × 1 = 20)**

**46.** When x[n]={1,2,3,4,5}, h[n]={1} then x[n]*h[n] is

(A) {1,3,6,10,15} (B) {1,2,3,4,5}

(C) {1,4,9,16,20} (D) {1,4,6,8,10}

**47.** Periodic function of half wave symmetry is necessarily

(A) an even function

(B) an odd function

(C) neither odd nor even

(D) both odd and even

**48.** Fourier transform of f(t) is $\int_0^\infty \emptyset(t) cos\omega t\, dt$ if and only if

(A) t is real and f(t) is real

(B) t is real and f(t) is even

(C) f(t) is real and f(t) is odd

(D) the function is f(t) $e^{-j\omega t}$

**49.** Fourier series of an odd periodic function contains only

(A) odd harmonics

(B) even harmonics

(C) cosine terms

(D) sine terms

**50.** FIR filters are

(A) non-recursive type

(B) recursive type

(C) neither recursive nor non-recursive

(D) None of these

**51.** The first order thermometer used has a time constant of 50 sec. If it is subjected to a sinusoidal input at cycling of 0.002 Hz, then time lag produced in the instrument will be

(A) 0.02 sec (B) 22.3 sec

(C) 44.6 sec (D) 50 sec

**52.** Accuracy is specified as ±0.5% of true value. At 5% of full scale, error of the instrument will be

(A) ±0.025% (B) ±0.5%

(C) ±2.5 % (D) ±25%

**53.** Largest deviation from the mean is

(A) Range of doubt

(B) Possible error

(C) either (A) or (B)

(D) standard deviation

**Space For Rough Work**

54. In modern measurement systems, undesirable static characteristics are

(A) dead zone

(B) drift

(C) static error and non-linearity

(D) All of these

55. A force digital transducers measures the pressure in the range of 0-200 N with a resolution of 0.1% of full scale. The smallest change it can measure is

(A) 0.2 N (B) 0.4 N

(C) 0.5 N (D) 1.0 N

56. Given F(z) the inverse transform $z^{-1}(F(z))$ yields

(A) f(t)

(B) f(t + kT)

(C) f(kT) for k = 0, 1, 2, 3...

(D) f(t − kT)

57. Which of the following gives the describing function of an ideal relay ?

(A) $4M/\pi X$

(B) $3X^2/4$

(C) $4M/\pi X$ with angle $\tan^{-1}(1/X)$

(D) None of these

58. The process of constructing models from experimental data is called

(A) system modification

(B) system compression

(C) system conversion

(D) system identification

59. Limit cycles are unique features of

(A) linear systems

(B) non-linear systems

(C) time variant systems

(D) time independent systems

**Space For Rough Work**

60. Non-invasive device that measures impulses from eyes and ears to record blood flow between heart and brain is

(A) Doppler flowmeter

(B) echoencephalograph

(C) oculoplethysmograph

(D) electrode contact analyzer

61. In nuclear instrumentation, heaviest and flow moving particles are

(A) beta particles

(B) alpha particles

(C) gamma rays

(D) protons

62. Hemoglobin is contained in

(A) WBC's

(B) RBC's

(C) platelets

(D) protein

63. Spectrophotometer uses

(A) selection filter

(B) silver filter

(C) mono chromometer

(D) chloridimeter

64. Average life of a radioactive substance with half life as 50 days is

(A) 42.15 days

(B) 52.15 days

(C) 62.15 days

(D) 72.15 days

65. When ECG is recorded by connecting two electrodes, one is on left arm and other is on left leg, recording is made in

(A) Lead I configuration

(B) Lead II configuration

(C) Lead I and Lead II configurations

(D) Lead III configuration

**Space For Rough Work**

## (SECTION – II)

**Each question carries two marks.** **(10 × 2 = 20)**

**66.** What is the pulse separation in mode locked Nd:YAG laser when fluorescent line width is $1.1 \times 10^{11}$Hz and laser rod is 0.1m long ?

(A) 0.5ns (B) 0.6ns
(C) 0.7ns (D) 0.8ns

**67.** Fourier series coefficient of time domain signal is $x(K) = (-1/3)^{|K|}$ at w = 0. The corresponding time domain signal will be

(A) 4/(5 + 3 sint) (B) 5/(4 + 3 sint)
(C) 4/(5 + 3 cost) (D) 5/(4 + 3cost)

**68.** The basic process that goes on inside DSP chip is

(A) Quantization
(B) MAC
(C) Log transform
(D) vector calculation

**69.** A voltmeter is used to measure a voltage of 75V. If 40% of reading are within 0.8V for true values then its standard deviation will be [P(0.5025) = 2]

(A) 0.4 (B) 0.75
(C) 1.592 (D) 1.753

**70.** A variable reluctance type tachometer has 60 rotor slots. If counter record 3600 counts /sec then speed is

(A) 60 rpm (B) 360 rpm
(C) 180 rpm (D) 300 rpm

**71.** Two linear block are connected in cascade with sampler. Determine the pulse response of the function of G1(s)= 1/s and G2(s) = 1/(S+2).

(A) $Z/[(z-1)(z-e^{-2T})]$
(B) $Z^2/[(z-1)(z-e^{-2T})]$
(C) $Z/[(z-1)(z-2)]$
(D) $Z^2/[(z-1)(z-2)]$

**72.** Which of the following is performance measure for minimum fuel problem in optimal control system ?

(A) $\int_{t0}^{tf} X^TQX + U^TRU\, dt$
(B) $\int_{t0}^{tf} X^TQX - U^TRU\, dt$
(C) $\int_{t0}^{tf} |u|\, dt$
(D) $\int_{t0}^{tf} |u|^2\, dt$

**73.** The initial value of function f*(t) can be obtained from F(Z) by

(A) Lt F(Z) as $z \to 0$
(B) Lt F(Z) $z \to \infty$
(C) Lt F(Z) as $z \to 1$
(D) None of the above

**74.** What is cardiac output when heart rate is 75 beats/min and stoke volume is 50 ml/beat ?

(A) 2.75 l/m (B) 3.75 l/m
(C) 4.75 l/m (D) 5 /m

**75.** What is half life of radioactive material if activity drops to $1/16^{th}$ of its initial value in 20 years ?

(A) 2 yrs (B) 3 yrs
(C) 5 yrs (D) None

**Space For Rough Work**

## Space For Rough Work