इन्जीनियरिंग सेवा परीक्षा, 2009
Engineering Service Examination.

*DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO*

**T.B.C. : O-FTF-J-FFB**

**Test Booklet Series**

**Serial No.** 28373

**A**

# TEST BOOKLET

## ELECTRICAL ENGINEERING

## Paper II

*Time Allowed : Two Hours* *Maximum Marks : 200*

### INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET *DOES NOT* HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** write ***anything else*** on the Test Booklet.
4. This Test Booklet contains **120** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. 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.
5. You have to mark all your responses ***ONLY*** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer Sheet.*** You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong Answers :**
    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.
    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third (0·33)** of the marks assigned to that question will be deducted as penalty.
    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

*DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO*

**1.** Consider the following tests :

1. Load test
2. Short circuit test
3. OC test
4. Retardation test

Which of the above tests are to be conducted for the determination of voltage regulation of a transformer ?

(a) 1 only

(b) 2 only

(c) 2 and 3

(d) 3 and 4

**2.** A three phase 50 Hz, 11 kV and 37·5 MW at 0·9 p.f. capacity synchronous generator has its stator bore diameter of 765 cm and an axial core length of 80 cm. For which power plant this generator is suitable ?

(a) Thermal coal fired plant

(b) Hydroelectric power plant

(c) Nuclear power plant

(d) Pumped storage power plant

**3.** A transistor has a maximum power dissipation limit of 300 mW for ambient temperature up to 25°C. If the maximum allowable junction temperature is 175°C, then what is the limit of the device in an ambient temperature of 55°C ?

(a) 120 mW

(b) 240 mW

(c) 300 mW

(d) 360 mW

**4.** Which stack is used in 8085 microprocessors ?

(a) FIFO

(b) FILO

(c) LIFO

(d) LILO

**5.** An angle modulated signal is described by the equation

$$x_c(t) = 10\cos[2\pi f_c t + 10\sin(4000\pi t) + 5\sin 2000\pi t]$$

What is the bandwidth of this modulated signal ?

(a) 6 kHz

(b) 45 kHz

(c) 54 kHz

(d) 63 kHz

**6.** If the turn on and turn off energy losses in a transmitter are 51 mJ and 76·8 mJ respectively and the mean power loss is limited to 200 W, what is the maximum switching rate that can be achieved ?

(a) 15649 cycles/s

(b) 156·49 cycles/s

(c) 1564·9 cycles/s

(d) 15·649 cycles/s

**7.** The antenna current of an A.M. transmitter is 8 A when only carrier is sent, but it increases to 8·93 A when the carrier is modulated. Then what is the percentage modulation of the wave ?

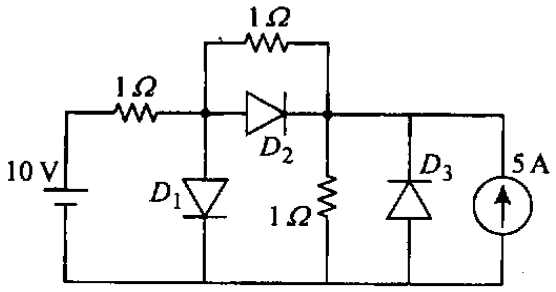
(a) 43·00%

(b) 70·14%

(c) 57·00%

(d) 100·00%

8.




What are the states of the three ideal diodes in the circuit as shown above ?

| | $D_1$ | $D_2$ | $D_3$ |
|---|---|---|---|
| (a) | On | Off | Off |
| (b) | Off | On | Off |
| (c) | On | Off | On |
| (d) | Off | On | On |

9. Number of thyristors, each with a rating of 500 V, 75 A, required in each branch of a series-parallel combination for a circuit with a total voltage and current ratings of 7·5 kV and 1 kA respectively. If the device derating factor is 14%, then what is the number of thyristors in series and parallel branch respectively ?

| | *No of thyristors in series branch* | *No of thyristors in parallel branch* |
|---|---|---|
| (a) | 18 | 16 |
| (b) | 15 | 14 |
| (c) | 12 | 12 |
| (d) | 16 | 18 |

10. Where is the draft tube of a hydropower station that is an airtight pipe located ?

(a) Near the surge tank

(b) In between the penstock and the runner

(c) In between the runner exhaust and the tailrace

(d) At the beginning of penstock

11. An F.M. signal which is modulated by a 4 kHz sine wave reaches a maximum frequency of 100·01 MHz and minimum frequency of 99·97 MHz, then what is the one side frequency deviation of the signal ?

(a) 6·67

(b) 5·00

(c) 10·0

(d) 20·0

12. What is the power transmitted inductively in an auto-transformer which supplies a load at 161 volts with an applied primary voltage of 230 volts ?

(a) 35% of the input

(b) 70% of the input

(c) 15% of the input

(d) 30% of the input

13. The starting current and torque of a three phase induction motor on direct line starting is 30 Amp and 300 Nm respectively. What are the corresponding values with star delta starter ?

(a) 10 A and 100 Nm

(b) 30 A and 300 Nm

(c) 17·32 A and 173·2 Nm

(d) 30 A and 173·3 Nm

**14.** Consider the following statements :

HVDC transmission is superior to HVAC transmission due to

1. Lack of reliable DC circuit breakers.
2. Lesser number of conductors for same power carrying capacity.
3. Non synchronous link between two different systems simplifying the problem of voltage stability and frequency control.
4. No costly terminal equipments such as converters and inverters are required.

Which of the above statements is/are correct ?

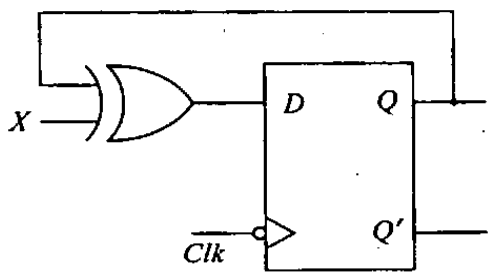
(a) 4 only

(b) 4 and 3

(c) 1 and 2

(d) 2 and 3

**15.**




The digital circuit as shown above represents to which one of the following ?

(a) JK flip-flop

(b) Clocked RS flip-flop

(c) T flip-flop

(d) Ring counter

**16.** Consider the following :

1. Sign flag
2. Trap flag
3. Parity flag
4. Auxiliary carry flag

Which of the above flags is/are present in 8085 microprocessor ?

(a) 1 only

(b) 1 and 2

(c) 2 and 3

(d) 1, 3 and 4

**17.** Which one of the following is ***not*** a part of typical TV receiver ?

(a) Sweep signal generator

(b) Envelope detector

(c) Video amplifier

(d) Pre-emphasis circuit

**18.** The anode current through a conducting SCR is 10 A. If its gate current is made one-fourth, then what will be the anode current ?

(a) 0 A

(b) 5 A

(c) 10 A

(d) 20 A

**19.** What is the power transferred conductively from primary to secondary of an auto-transformer having transformation ratio of 0·8 supplying a load of 3 kW ?

(a) 0·6 kW

(b) 2·4 kW

(c) 1·5 kW

(d) 0·27 kW

**20.** Consider the following statements concerning steam power plants :

1. Maintenance and operating costs are low.
2. Water is required in huge quantity.
3. Requires long time for installation.
4. Handling of coal and disposal of ash can be done easily.

Which of the above statements is/are correct ?

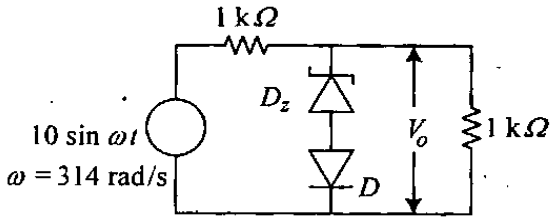
(a) 1 only

(b) 2 and 3

(c) 3 only

(d) 3 and 4

**21.**




The cut-in voltage of zener diode $D_z$ and diode $D$ shown in the figure above is 0·7 V. Breakdown voltage of $D_z$ is 3·3 V and reverse breakdown voltage of $D$ is 50 V. The other parameters can be assumed to be the same as those of an ideal diode. Then what are the values of the peak output voltage $V_o$ ?

| | Positive Half cycle in V | Negative Half cycle in V |
|---|---|---|
| (a) | 3·3 | 1·4 |
| (b) | 4 | 5 |
| (c) | 3·3 | 3·3 |
| (d) | 4 | 4 |

**22.** Consider the following statements :

In 8085 microprocessor, data-bus and address-bus are multiplexed in order to

1. Increase the speed of microprocessor.
2. Reduce the number of pins.
3. Connect more peripheral chips.

Which of the above statements is/are correct ?

(a) 1 only

(b) 2 only

(c) 2 and 3

(d) 1, 2 and 3

**23.** In a power circuit of 3 kV, four thyristors each of rating 800 V are connected in series. What is the percentage series derating factor ?

(a) 50

(b) 25

(c) 12·5

(d) 6·25

**24.** What is the core loss in a high frequency ferrite core transformer used in SMPS power supply ?

(a) 10% of rated power

(b) 5% of rated power

(c) 2% of rated power

(d) 1% of rated power

25. Which one of the following is considered as an A.M. signal ?

(a) Binary phase shift keying (BPSK)

(b) Differential phase shift keying (DPSK)

(c) Differential encoded PSK

(d) Quadrature PSK

26. For 16 bit address-bus, if an 8K RAM chip is selected when, $A_{13}$, $A_{14}$ and $A_{15}$ address bits are all one, then what is the range of the memory address ?

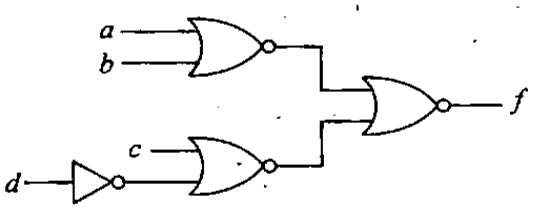
(a) EOOOH – EFFFH

(b) EOOOH – FFFFH

(c) FOOOH – FFFFH

(d) FOOOH – FEEEH

27.




Which one of the following is the correct output ($f$) of the above circuit ?

(a) $(a+b)(c+\bar{d})$

(b) $(\bar{a}+\bar{b})(c+\bar{d})$

(c) $(a+\bar{b})(c+\bar{d})$

(d) $(a+b)(\bar{a}+\bar{d})$

28. The making and breaking currents of 3 phase ac circuit breakers in power system are respectively in what form ?

(a) r.m.s. value, r.m.s. value

(b) instantaneous value, r.m.s. value

(c) r.m.s. value

(d) instantaneous value, instantaneous value

29. A three phase 6 pole 50 Hz induction motor is running at 5% slip. What is the speed of the motor ?

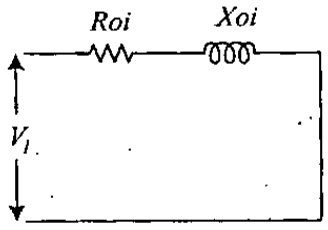
(a) 850 rpm

(b) 900 rpm

(c) 950 rpm

(d) 1000 rpm

30.




At which condition of the transformer the equivalent circuit will be as shown in the above figure ?

(a) Under short circuit

(b) Under open circuit

(c) Under no load

(d) Under rated load

31. What is the nominal pH value of water that is to be maintained in a steam raising thermal power station ?

(a) 0·0

(b) 7·0

(c) 8·5

(d) 14·3

32. Consider the following statements about a Tunnel diode :

1. Tunnelling takes place at a speed decided by junction temperature.
2. Concentration of impurities is of the order of 1 part in $10^3$.
3. Both tunnelling current and normal pn junction injection current exist.
4. Tunnel diode exhibits current controlled negative resistance, characteristic, only.

Which of the above statements is/are correct ?

(a) 1 only

(b) 1 and 2

(c) 2 and 3

(d) 3 and 4

33. In an instruction of 8085 microprocessor, how many bytes are present ?

(a) One or two

(b) One, two or three

(c) One only

(d) Two or three

34. Which one of the following factors is limited in case of F.M. ?

(a) Maximum frequency deviation

(b) Maximum permissible modulation index

(c) Signal to noise voltage ratio

(d) Minimum permissible modulation index

35. Consider the following statements, with respect to the power transistors used in inverters :

1. Maximum collector-emitter voltage VcEo.
2. Maximum collector current.
3. Maximum power dissipation.
4. Maximum current gain at minimum load current.
5. Maximum current gain at maximum load current.

Which of the above statements is/are correct ?

(a) 1 only

(b) 1, 2, 3 and 5

(c) 2 and 3 only

(d) 2, 3 and 4

36. When will a slip ring induction motor run at super synchronous speed ?

(a) If a voltage is injected in the rotor circuit in phase opposition to the rotor induced emf

(b) If an emf is injected in the rotor circuit in phase with the rotor induced emf

(c) If motor is coupled with active load

(d) If motor is coupled with passive load

**37.** Consider the following statements :

1. Present day surge diverters use non-linear resistance elements.
2. A travelling wave is usually represented as a step wave in the analysis.
3. A travelling wave suffers reflection when it reaches a discontinuity.
4. The function $(f(vx \pm t))$ represents a travelling wave.

Which of the above statements is/are correct ?

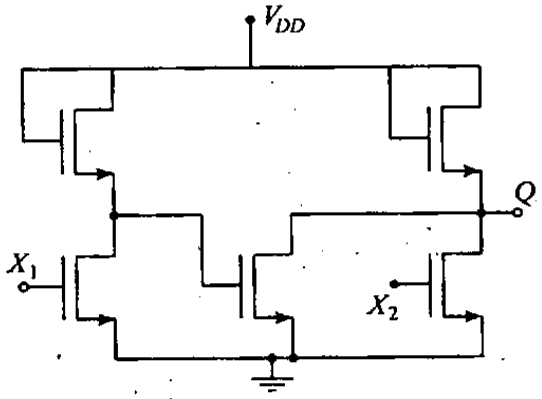
(a) 1 only

(b) 1 and 2 only

(c) 1, 2 and 3

(d) 3 and 4 only

**38.**




If $X_1$ and $X_2$ are the inputs to the circuit as shown in the above figure, then what is the output $Q$ ?

(a) $(X_1 + X_2)'$

(b) $(X_1 - X_2)'$

(c) $(X_1 \bullet X_2)$

(d) $(X_1 \bullet X_2')$

**39.** To address the memory 14 bits are used. Then what is the address of the last memory location ?

(a) 16382

(b) 16383

(c) 16384

(d) 16385

**40.** Which one of the following modulation technique is most affected by noise ?

(a) ASK

(b) PSK

(c) FSK

(d) MSK

**41.** For elimination of 5th harmonics from the output of an inverter, what will be the position of pulse in a PWM inverter ?

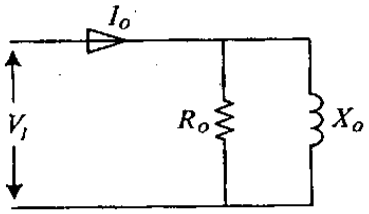
(a) 72°

(b) 36°

(c) 60°

(d) 90°

**42.**




At which condition of the transformer the equivalent circuit will be as shown above ?

(a) Under short circuit

(b) Under rated load

(c) Under open circuit

(d) Under load and no load

**43.** Complete combustion of pulverized coal in a steam raising thermal power plant is ensured by what type of an analysis of flue gas going out by the chimney ?

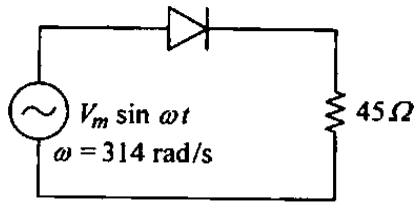
(a) $O_2$ content for given air intake

(b) $CO_2$ content for given fuel rate feed

(c) CO content

(d) All of the above

**44.**




The forward resistance of the diode shown in the above circuit is 5 ohms, and the other parameters are same as those of an ideal diode. Then what is the d.c. component of the source current ?

(a) $\frac{V_m}{50\pi}$

(b) $\frac{V_m}{50\pi\sqrt{2}}$

(c) $\frac{V_m}{100\pi\sqrt{2}}$

(d) $\frac{2V_m}{50\pi}$

**45.** Match List I with List II and select the correct answer using the code given below the Lists :

| List I *(Instruction code)* | List II *(Addressing mode)* |
|---|---|
| A. JUMP 2021 H | 1. Direct addressing |
| B. LDAX B | 2. Immediate addressing |
| C. IN 10H | 3. Indirect Register addressing |
| D. RLC | 4. Implicit addressing |

Code :

| | A | B | C | D |
|---|---|---|---|---|
| (a) | 4 | 3 | 1 | 2 |
| (b) | 2 | 3 | 1 | 4 |
| (c) | 4 | 1 | 3 | 2 |
| (d) | 2 | 1 | 3 | 4 |

**46.** Two MOSFETS $M_1$ and $M_2$ are connected in parallel to carry a total current of 20 A. The drain to source voltage of $M_1$ is 2·5 V and that of $M_2$ is 3 V. What are the drain currents of $M_1$ and $M_2$ when the current sharing series resistances are each of 0·5 $\Omega$ ?

(a) 10·5 A and 9·5 A

(b) 9·5 A and 10·5 A

(c) 10·5 A and 10·5 A

(d) 9·5 A and 9·5 A

**47.** If an FM wave is represented by the equation $e = 10 \sin (9 \times 10^8 t + 4 \sin 1500\, t)$, then what is the carrier frequency ?

(a) 127·32 MHz

(b) 150·00 MHz

(c) 143·31 MHz

(d) 208·00 MHz

**48.** In a single phase VSI bridge inverter, the load current is $I_o = 200 \sin(\varpi t - 45°)$ mA. The d.c. supply voltage is 220 V. What is the power drawn from the supply ?

(a) 9·8 W

(b) 19·8 W

(c) 27·25 W

(d) 34·03 W

**49.** Which one of the following is a disadvantage of digital transmission as compared to analog transmission ?

(a) Digital signals cannot be multiplexed efficiently

(b) Digital transmission is less immune to channel noise

(c) Digital signals needs to be coded before transmission

(d) Digital transmission needs more bandwidth

**50.** What are the number of memories required of size $16 \times 4$ to design a memory of size $64 \times 8$ ?

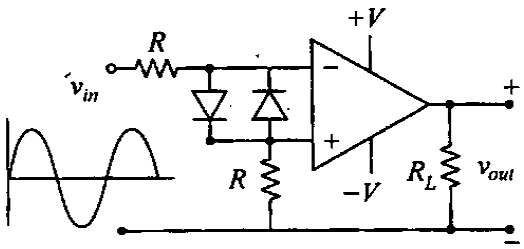
(a) 2

(b) 4

(c) 6

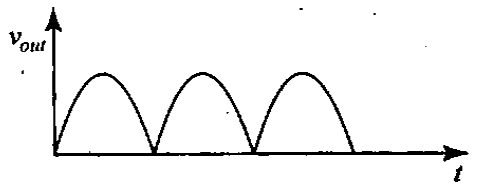
(d) 8

**51.**

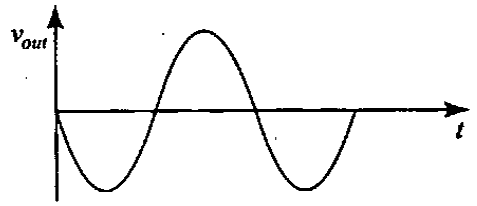



For the above circuit what will be the output for the sinusoidal input shown at the input terminal ?

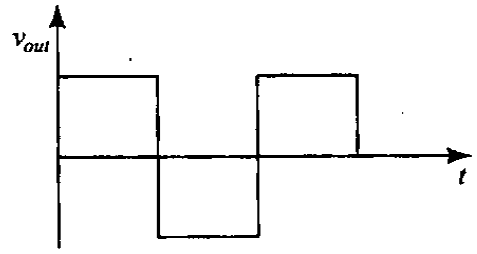
(a)



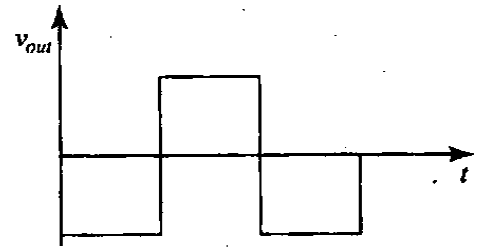

(b)




(c)




(d)




**52.** A salient pole synchronous generator delivering power to an infinite bus through a reactive tie line reaches its steady state stability limit. What is the power angle of the generator relative to the infinite bus voltage reference ?

(a) Greater than 90 degrees

(b) Equal to 90 degrees

(c) Less than 90 degrees

(d) Zero

**53.** The starting current of an induction motor is 5 times the full-load current while the full-load slip is 4%. What is the ratio of starting torque to full-load torque ?

(a) 0·6

(b) 0·8

(c) 1·0

(d) 1·2

**54.** Consider the following statements :

EMF induced per phase in an alternator depends on

1. Frequency
2. Number of turns per phase
3. Pitch factor
4. Distribution factor

Which of the above statements is/are correct ?

(a) 1 only

(b) 1, 2, 3 and 4

(c) 2 and 3 only

(d) 3 and 4 only

**55.** Consider the following statements regarding the pumped storage plants :

1. A pumped storage plant is a peak load plant.
2. The starting time of a pumped storage plant is very long.
3. Reversible turbines and pumps are very suitable for pumped storage plants.
4. Pumped storage plants can be used for load frequency control.

Which of the above statements is/are correct ?

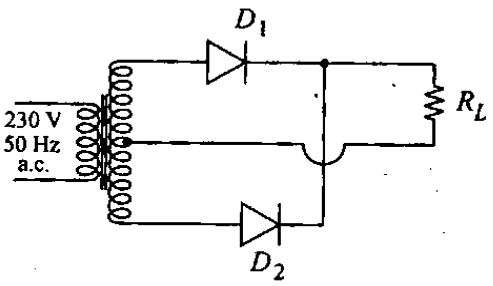
(a) 1 only

(b) 1 and 2 only

(c) 1, 3 and 4

(d) 3 and 4 only

**56.**




230 V / 50-0-50 V

The input voltage for the given full-wave rectifier circuit is 230 V a.c. then what is the peak inverse voltage across diodes $D_1$ and $D_2$ ?

(a) $100\sqrt{2}$ Volts

(b) 100 Volts

(c) $50\sqrt{2}$ Volts

(d) 50 Volts

**57.** Which one of the following addressing technique is ***not*** used in 8085 microprocessor ?

(a) Register

(b) Immediate

(c) Register indirect

(d) Relative

**58.** An AM modulator has output

$S(t) = 20\cos(300\pi t) + 6\cos(320\pi t) + 6\cos(280\pi t)$.

Then what is the modulation index of the wave ?

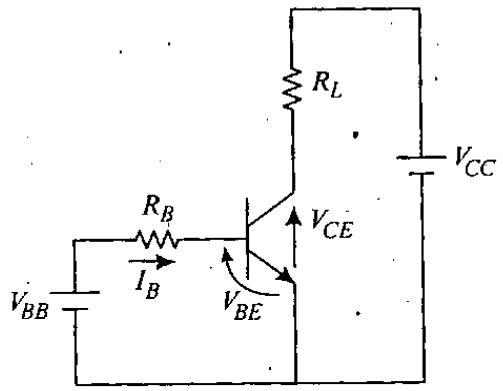
(a) More than 100%

(b) 0·93

(c) 0·3

(d) 0·6

**59.**




$\beta$ of a BJT varies from 15 to 65. $R_L = 10\ \Omega$, $V_{CC} = 120$ V and $V_{BB} = 8$ V. If $V_{CE(Sat)} = 1{\cdot}5$ V and $V_{BE(Sat)} = 1{\cdot}75$ V then what is the value of $R_B$ that will result in saturation with an overdrive factor of 10 ?

(a) $7{\cdot}9\ \Omega$

(b) $0{\cdot}79\ \Omega$

(c) $79\ \Omega$

(d) $7{\cdot}9\ k\Omega$

**60.** What is the effect of blanking time on output voltage in PWM inverter ?

(a) Distortion in instantaneous voltage at current zero crossing

(b) Low order space harmonics in output voltage

(c) Distribution in instantaneous voltage at voltage zero crossing

(d) High order time harmonics in output voltage

**61.** Consider the following statements :

The thermal noise power generated by a resistor is proportional to

1. The value of the resistor.
2. The absolute temperature.
3. The bandwidth over which it is measured.
4. The Boltzmann's constant.

Which of the above statements is/are correct ?

(a) 1, 2 and 3

(b) 2 only

(c) 2 and 3 only

(d) 2, 3 and 4

**62.** Consider the following statements :

1. The output unit of a computer communicate the response of the computer to the user.
2. Read/write memory is volatile.
3. The flip-flops in a register are connected in parallel.

Which of the above statements is/are correct ?

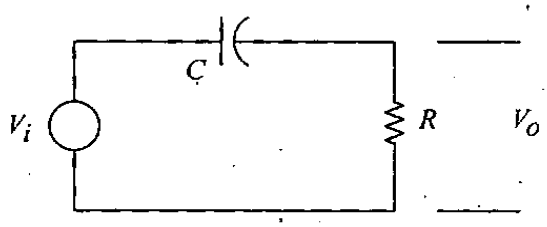
(a) 1 only

(b) 1 and 2

(c) 2 and 3

(d) 3 only

**63.**




In the above shown circuit, under what conditions the output $V_o$ will be proportional to $\frac{dv_i}{dt}$ (with $T$ = time period of input)

(a) $RC = T$

(b) $RC >> T$

(c) $RC << T$

(d) Both $R$ and $C$ large

**64.** Transient stability of a 3-phase power systems having more than one synchronous generator is not affected by which one of the following specifications ?

(a) Initial operating conditions of generators

(b) Quantum of large power disturbance

(c) Fast fault clearance and redo sure

(d) Small changes in system frequency

**65.** Consider the following :

1. L.P.F. method
2. E.M.F. method
3. Z.P.F. method
4. M.M.F. method

Which of the above methods are correct for determination of voltage regulation of an alternator ?

(a) 1, 2 and 3

(b) 2, 3 and 4

(c) 2 and 3 only

(d) 3 and 4 only

**66.** Match List I with List II and select the correct answer using the code given below the Lists :

| List I *(Machine Components)* | List II *(Type of Machine)* |
|---|---|
| A. Amortisseur winding | 1. Squirrel cage induction motor |
| B. Breather | 2. D.C. motor |
| C. End-Rings | 3. Transformer |
| D. Commutator | 4. Synchronous motor |

Code :

| | A | B | C | D |
|---|---|---|---|---|
| (a) | 2 | 3 | 1 | 4 |
| (b) | 4 | 3 | 1 | 2 |
| (c) | 2 | 1 | 3 | 4 |
| (d) | 4 | 1 | 3 | 2 |

**67.** The maximum demand of a consumer is 2 kW and the corresponding daily energy consumption is 30 units. What is the corresponding load factor ?

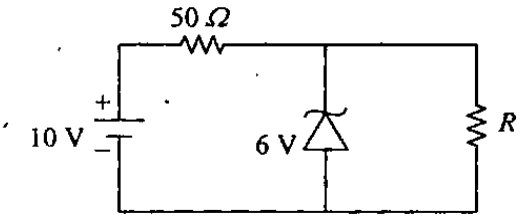
(a) 25%

(b) 50%

(c) 62·5%

(d) 75%

**68.**




The 6 V zener diode as shown in the circuit above, has zero zener resistance and a knee current of 5 mA. Then what is the minimum value of $R$ so that the voltage across it does not fall below 6 V ?

(a) 1200 ohms

(b) 80 ohms

(c) 50 ohms

(d) 40 ohms

**69.** When the operand requires for an instruction is stored inside the processor, then what this addressing mode is called ?

(a) Direct

(b) Register

(c) Implicit

(d) Immediate

**70.** How much power will an AM transmitter, rated at 50 kW, radiate if it is modulated to 100% ?

(a) 25 kW

(b) 50 kW

(c) 75 kW

(d) 100 kW

**71.** For an SCR, the gate cathode characteristic has a straight line slope of 140. For trigger source voltage of 20 V and allowable gate power dissipation of 0·5 Watts, what is the gate source resistance ?

(a) 200 $\Omega$

(b) 255 $\Omega$

(c) 195 $\Omega$

(d) 185 $\Omega$

**72.** An AC capacitor is to be switched in parallel with AC line using back to back connected thyristor. What is the firing angle of thyristor for first switching ?

(a) 0°

(b) 180°

(c) 90°

(d) 45°

**73.** A communication channel is to receive signal power S and the noise at the receiver input is additive thermal noise, with uniform power spectral density (psd). It is found that if the bandwidth is 1 MHz, the channel capacity is 10 Mbps. What would be the channel capacity for the same signal power and same noise psd, if the bandwidth is unlimited (tends to be infinite) ?

(a) Zero

(b) Infinite

(c) 15 Mbps

(d) 1·5 Gbps

**74.** Match List I with List II and select the correct answer using the code given below the Lists :

| List I *(Microprocessor pin)* | List II *(Signals on pin)* |
|---|---|
| A. TRAP | 1. Interrupt |
| B. HLDA | 2. Initializing |
| C. RESET | 3. Enable |
| D. ALE | 4. Memory access |

Code :

| | A | B | C | D |
|---|---|---|---|---|
| (a) | 1 | 2 | 4 | 3 |
| (b) | 3 | 2 | 4 | 1 |
| (c) | 1 | 4 | 2 | 3 |
| (d) | 3 | 4 | 2 | 1 |

**75.** Consider the following statements :

1. Only even harmonics are present in the output.
2. Provides more output per device for a given amount of distortion.
3. Core saturation of transformer is avoided.
4. Power supply hum is absent in the output.

Which of the above statements is/are correct for a push-pull amplifier ?

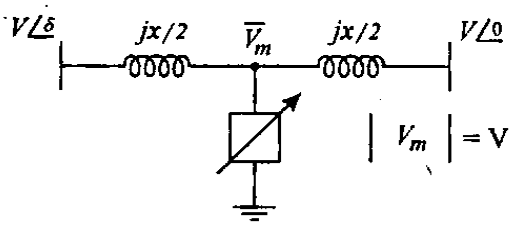
(a) 1 only

(b) 1 and 2 only

(c) 1, 2 and 3

(d) 2, 3 and 4

**76.**




In a transmission line, the mid-point voltage is maintained to $V$ by a compensating device as shown in the circuit above. What is the real power flow through the line ?

(a) $\frac{V^2}{X}\sin\frac{\delta}{2}$

(b) $\frac{2V^2}{X}\sin\delta$

(c) $\frac{V^2}{X}\sin\delta$

(d) $\frac{2V^2}{X}\sin\frac{\delta}{2}$

**77.** What is the rotor copper loss of a 3 phase 550 Volt, 50 Hz, 6 poles induction motor developing 4·1 kW at the shaft with mechanical loss of 750 W at 970 rpm ?

(a) 175 W

(b) 150 W

(c) 100 W

(d) 250 W

**78.** In what form the initial energy will be released for the 200 MeV per fission by a neutron in a slow thermal nuclear reactor ?

(a) Heat energy

(b) Electromagnetic radiation

(c) Kinetic energy of particles and electromagnetic radiation

(d) Kinetic and sound energy

**79.** In a certain self biased Si npn transistor the d.c. base voltage is 3·2 V then what is the d.c. emitter voltage ? (Assume the transistor is in linear-active mode)

(a) 0·7 V

(b) 2·5 V

(c) 3·2 V

(d) 3·9 V

**80.** What is the correct 8085 assembly language instruction that stores the contents of H and L registers into the memory locations 1080 H and 1081 H respectively ?

(a) SPHL 1080 H

(b) SHLD 1080 H

(c) STAX 1080 H

(d) SPHL 1081 H

**81.** For which one of the following modulated signals, the original message, up to a scaling factor can be recovered using envelope detection ?

(a) $20\cos(200\pi t) + 30\, m(t)\cos(200\pi t)$

(b) $20\cos(200\pi t) + 16\, m(t)\cos(200\pi t)$

(c) $10\, m(t)\cos(400\pi t)$

(d) $10\cos m(t)\cos(400\pi t)$

**82.** An SCR is rated for 650 V PIV. What is the voltage for which the device can be operated if the voltage safety factor is 2 ?

(a) 325 V rms

(b) 230 V rms

(c) 459 V rms

(d) 650 V rms

**83.** A-6-pulse SCR converter is connected to a 230 V, 3-phase, 50 Hz, ac mains and is controlling a dc drive with terminal voltage 205 volt and rated current of 105 Amp. The commutation angle $\mu = 18°$ and firing angle $\alpha = 45°$, what is the rating of shunt compensator and power factor ?

(a) 21·6 kVAR, 0·707

(b) 22·68 kVAR, 0·69

(c) 21·6 kVAR, 0·69

(d) 22·68 kVAR, 0·707

**84.** Which one of the following statements is correct ?

The threshold effect in demodulators is

(a) Exhibited by all receivers when the input SNR is low

(b) Exhibited only by correlation receivers

(c) The rapid fall in the output SNR when input SNR falls below a particular value

(d) The exponential rise in the output SNR when input SNR is increased above a particular value

**85.** The stack pointer of an 8085 microprocessor is ABCDH. At the end of execution of the sequence of instructions, what will be the content of the stack pointer ?

```
PUSH PSW
XTHL
PUSH D
JMP  FC70H
```

(a) ABCBH

(b) ABCAH

(c) ABC9H

(d) ABC8H

**86.** What is the main source of distortion in a push-pull amplifier ?

(a) Fundamental component

(b) Second harmonic

(c) Third harmonic

(d) All even harmonics

**87.** Which one of the following is reduced by using stock bridge dampers on power overhead transmission lines ?

(a) Sag

(b) Conductor vibration

(c) Line losses

(d) Mechanical tension

**88.** A single phase full converter feeds power to *RLE* load with $R = 10\ \Omega$, $L = 10$ mH and $E = 50$ V, the ac source voltage is 230 V, 50 Hz. For continuous conduction, what is the average value of load current for firing angle delay of 60° ?

(a) 4·63 A

(b) 6 A

(c) 6·5 A

(d) 5·35 A

**89.** An 8085 microprocessor is executing the programme as follows :

```
        MVI A, 20 H
        MVI B, 10 H
BACK :  NOP
        ADD B
        RLC
        JNC BACK
        HLT
```

How many times the instruction NOP will be executed ?

(a) 4

(b) 3

(c) 2

(d) 1

**90.**

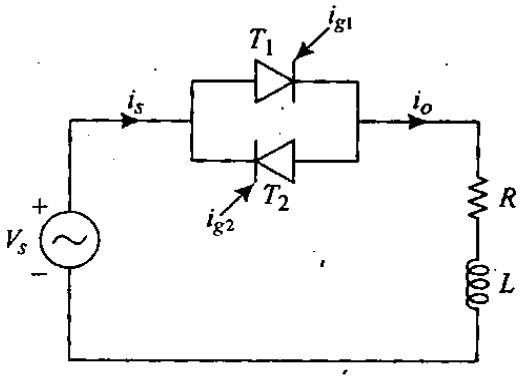



Fig-1

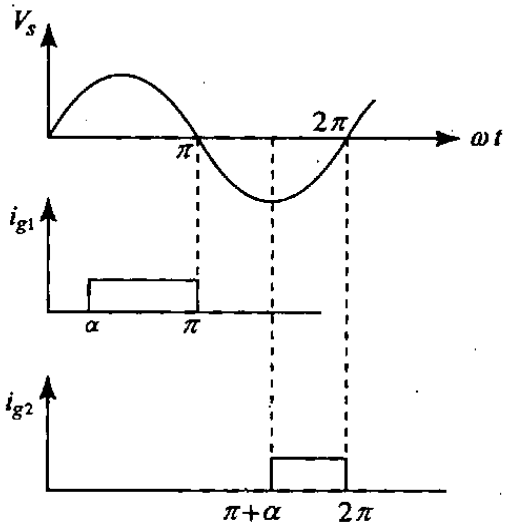
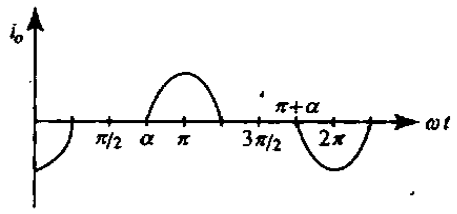


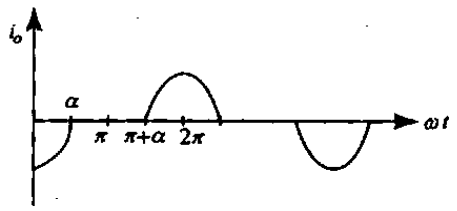

Fig-2

In the ac regulator of Fig-1, the supply voltage and gate currents waveforms are as in Fig-2, what is the load voltage waveform for $R = 0$ ?

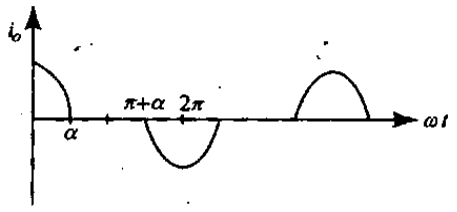
(a)



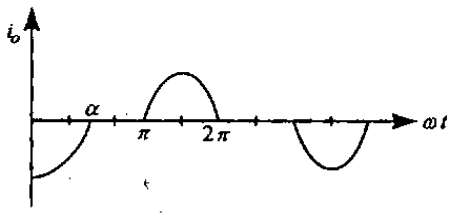

(b)




(c)




(d)



**91.** An amplifier without feedback, when fed with a 1 V, 50 Hz input signal gives an output of 30 V, 50 Hz with a 5% 2nd order distortion. When 10% of the output is fedback what is the 2nd order distortion ?

(a) 0·375 V

(b) 1·3 V

(c) 0·75 V

(d) 3 V

**92.** Match List I with List II and select the correct answer using the code given below the Lists :

| List I | List II |
|---|---|
| A. Magnetic flux density | 1. Siemens |
| B. Shunt admittance | 2. Tesla |
| C. Attenuation co-efficient | 3. Radian |
| D. Phase-change co-efficient | 4. Neper |

Code :

| | A | B | C | D |
|---|---|---|---|---|
| (a) | 3 | 4 | 1 | 2 |
| (b) | 2 | 4 | 1 | 3 |
| (c) | 3 | 1 | 4 | 2 |
| (d) | 2 | 1 | 4 | 3 |

**93.** What is the effect of the field failure of salient pole synchronous motor connected with infinite bus ?

(a) Reduce motor torque and speed

(b) Not charge motor torque and speed

(c) Stop the motor

(d) Reduce motor torque but motor will continue to run at synchronous speed

**94.** A DC chopper is used in regenerative braking mode of a dc series motor. The dc supply is 600 V, the duty cycle is 70%. The average value of armature current is 100 A. It is continuous and ripple free. What is the value of power fedback to the supply ?

(a) 3 kW

(b) 9 kW

(c) 18 kW

(d) 35 kW

**95.** What is the ratio of starting torque and maximum torque of a 3 phase, 50 Hz, 4 pole induction motor for a maximum torque at 1200 rpm ?

(a) 0·421

(b) 0·384

(c) 0·6

(d) 0·5

**96.** When a transistor is used in switching mode then what is the turn-on time ?

(a) Sum of delay time and rise time

(b) Sum of rise time and storage time

(c) Sum of delay time and storage time

(d) Sum of rise time and fall time

**97.** For which one of the following, the instruction XRA A in 8085 microprocessor can be used ?

(a) Set the carry flag

(b) Set the zero flag

(c) Reset the carry flag and clear the accumulator

(d) Transfer FFH to the accumulator

**98.** If a full wave fully controlled converter is modified as a full wave half controlled converter, what will be the maximum value of active power ($P$) and the maximum value of reactive power demand ($Q$) ?

| | $P$ | $Q$ |
|---|---|---|
| (a) | Double | Half |
| (b) | Unchanged | Unchanged |
| (c) | Half | Double |
| (d) | Unchanged | Half |

**99.** The power input to a 415 V, 50 Hz, 6 pole 3-phase induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and friction and windage losses total 2 kW. What is the efficiency of motor ?

(a) 92·5%

(b) 92%

(c) 90%

(d) 88%

**100.** A short transmission line having zero resistance and total series reactance of 0·4 pu is provided with reactive power compensation at the mid-point of the line such that the mid-point voltage is held at 0·96 pu when the voltage at both ends are 1·0 pu. What is the steady state power transmission limit of such a system ?

(a) 4·8 pu

(b) 0·0 pu

(c) 2·4 pu

(d) 9·6 pu

**101.** In single pulse modulation of PWM inverters, the pulse width is 120°. For an input voltage of 220 V dc, what is the rms value at the fundamental component of the output voltage ?

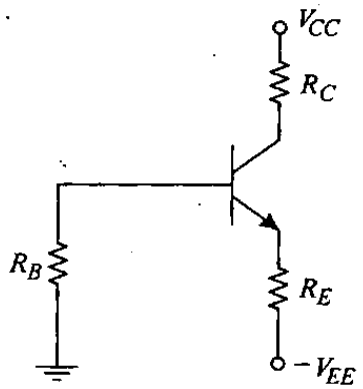
(a) 171·5 V

(b) 254·0 V

(c) 127·0 V

(d) 89·81 V

**102.**




The Si transistor as shown in the circuit above has $\beta = 50$ and negligible leakage current. If $V_{CC} = 18$ V, $V_{EE} = 4$ V, $R_E = 200\ \Omega$, $R_C = 4\ k\Omega$, $R_B = 72\ k\Omega$, what is the value of the quiescent collector current $I_{CQ}$ ?

(a) 1·1 mA

(b) 2 mA

(c) 5 mA

(d) 3·6 mA

**103.** An output device is interfaced with an 8085 microprocessor as memory-mapped I/O. The address of the device is 1000 H. In order to output data from the accumulator to the device, what will be the sequence of instructions ?

(a) LXI H, 1000H
MOV A, M

(b) LXI H, 1000H
MOV M, A

(c) LHLD 1000H
MOV A, M

(d) LHLD 1000H
MOV M, A

**104.** What is the form of the $Y_{bus}$ matrix for carrying out load flow studies by Gauss-Seidal method of a power system having mesh connection of nodes ?

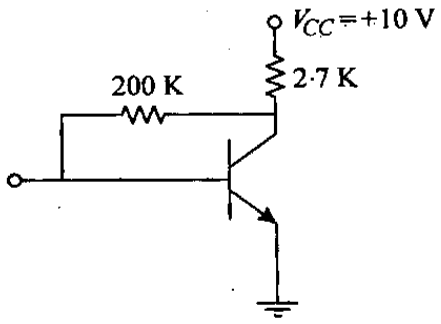
(a) Symmetric but not diagonal matrix

(b) Diagonal matrix

(c) Antisymmetric matrix

(d) Sparse asymmetric matrix

**105.**




In the above circuit as shown $\beta = 99$, $V_{BE} = 0{\cdot}6$ V, then what are the values of $V_C$ and $I_C$ corresponding to the operating point ?

(a) 4·6 V and 1·98 mA

(b) 4·7 V and 2·00 mA

(c) 5·4 V and 1·56 mA

(d) 4·2 V and 2·1 mA

**106.** Two fully controlled three-phase bridges are connected in anti parallel across a load to provide reversible DC voltage to the load. The bridges operate in circulating current mode. The input is 3-phase 440 volt, 50 Hz AC supply, and the maximum load current is 30 Amp. The peak value of the circulating current is taken to be 6 A. What is the value of inductance for limiting circulating current ?

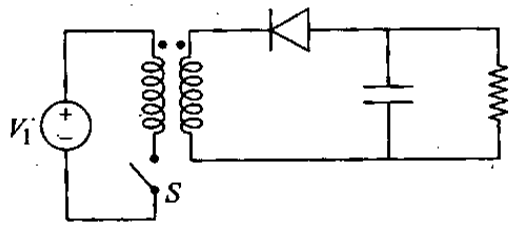
(a) 30 mH

(b) 32 mH

(c) 36 mH

(d) 38 mH

**107.**




For the isolated buck boost converter as shown in the circuit above, the output voltage is to be 35 V at a duty cycle of 30%. The DC input is obtained from a front end rectifier without voltage doubling fed from a 115 V AC. What is the peak forward blocking voltage of the switching element ?

(a) 232·3 V

(b) 69·69 V

(c) 162·61 V

(d) 542 V

**108.** If the amplification of a single stage is not sufficient or the input or output impedance is not of the correct magnitude for the intended application how may two stages be connected to achieve desired result ?

(a) Cascode connection

(b) Complementary symmetry connection

(c) Cascade connection

(d) Totem pole connection

***Directions :***

Each of the next Twelve (12) items consists of two statements, one labelled as the 'Assertion (A)' and the other as 'Reason (R)'. You are to examine these two statements carefully and select the answers to these items using the codes given below :

*Codes :*

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is ***not*** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

**109.** Assertion (A) : The rotor speed of induction motor is less than the synchronous speed of rotating magnetic field.

Reason (R) : At synchronous speed motor torque is zero.

**110.** Assertion (A) : Rotor core loss at rated speed of induction motor is negligibly small.

Reason (R) : Induced emf frequency of the rotor circuit at rated speed is very low, because slip of the motor at rated speed is low.

**111.** Assertion (A) : A capacitor is connected in the polarizing circuit of the mho relay to prevent its in operation when three phase faults occur very close to the relay.

Reason (R) : Capacitor provides memory action and thus maintains polarizing flux for several cycles following the fault.

**112.** Assertion (A) : In small-signal R-C coupled amplifiers the gain falls in the high frequency range.

Reason (R) : The decline in gain with frequency is due to the reactance of the coupling capacitor.

**113.** Assertion (A) : In a typical RC coupled amplifier, the gain falls at high frequencies.

Reason (R) : The amplifier has to use coupling capacitors in the input and output side for isolating dc biasing circuit and ac signal.

**114.** Assertion (A) : The DAC (Digital Analog Converter) cannot be interfaced to microprocessor in an interrupt driven mode.

Reason (R) : DAC neither needs a start convert pulse nor it has indication of conversion.

**115.** Assertion (A) : Monostable multivibrators (IC 74121) are used in a microprocessor based system for frequency measurement.

Reason (R) : Microprocessor counts the number of interrupt signals/second or within a specified interval through ISR.

**116.** Assertion (A) : Equalizers are used in receivers to increase the SNR of the demodulator.

Reason (R) : The equalizer is designed such that, their transfer function is inversely related to that of the channel.

**117.** Assertion (A) : FM is capable of exchanging SNR for the transmission bandwidth while in AM systems this feature is not available.

Reason (R) : Transmission bandwidth in FM systems is much higher than in AM systems.

**118.** Assertion (A) : DSB modulation scheme is superior to SSB modulation scheme as far as noise performance is concerned.

Reason (R) : DSB modulation requires twice the bandwidth as compared to SSB modulation.

**119.** Assertion (A) : FSK signalling is inferior to PSK signalling.

Reason (R) : PSK requires less bandwidth than FSK.

**120.** Assertion (A) : QPSK modulation allows higher data rate than BPSK for the same bandwidth occupying.

Reason (R) : Gray code is used for the 4 signals transmitted in QPSK.

**SPACE FOR ROUGH WORK**

**SPACE FOR ROUGH WORK**