INSTITUTE OF ENGINEERING

MODEL ENTRANCE EXAM

(SET – 7)

Instructions:

There are 100 multiple-choice questions, each having four choices of which only one choice is correct.

Date : 2081/03/22
(July 06)

Duration : 2 hours
Time : 8 A.M. – 10 A.M.

SECTION – A (1 marks) (1*60 = 60)

1) As soon as he _____, he went for a walk.
a) eats b) has eaten c) had eaten d) will eat

2) Choose the most appropriate form of indirect speech for the given sentence.
I said to her, "Why are you running so fast?"
a) I asked her whether she was running so fast.
b) I asked her why she had been running so fast.
c) I asked her whether had she been running so fast.
d) I asked her why she was running so fast.

3) Transform the given sentence into complex sentence.
"She returned home at midnight."
a) As it was midnight, she returned home.
b) She returned home and it was midnight.
c) She returned home when it was midnight.
d) Despite it being midnight, she returned home.

4) If she _____ to me, I would have given her the money she needed.
a) will come b) would come c) has come d) had come

5) Select the one which best expresses the given sentence into Passive / Active voice.
"Swastik could not complete his paper because he had a headache."
a) Swastik's paper could not be completed because he had a headache.
b) Swastik's paper would not be completed because he had a headache.
c) The paper of Swastik could not be completed by him because he had a headache.
d) The paper could not be completed by Swastik because he had a headache.

6) The universe is supposed _____ all the time.
a) to expand b) to have expanded
c) expanding d) to be expanding

7) You should apologize _____ not telling the truth.
a) in b) against c) for d) from

8) To ensure we stay up, we'll have to <u>bury the hatchet</u> and play to our strengths.
a) to stop talking to someone b) to end a quarrel
c) to bury old things d) to fight with someone

9) In the word 'development', where is the primary stress?
a) first syllable b) second syllable c) third syllable d) fourth syllable

10) Altruism (Synonym):
a) selfishness b) generosity c) greed d) indifference

11) Lenient (Antonym):
a) strict b) forgiving c) permissive d) easygoing

12) Which word contains the vowel phoneme /ʌ/?
a) Hut b) Hit c) Hot d) Hat

13) In Joule's law of heating, heat produced is directly proportional to:
a) current b) square root of current
c) square of current d) independent of current

14) Internal energy of real gas depends on:
a) Volume b) Temperature
c) Pressure d) Volume and Temperature

15) The dimension of Planck constant is same as that of:
a) Angular momentum b) Linear momentum
c) Energy d) Resistance

16) If an object of mass 'm' is moving in a circular path with uniform speed 'v', which of the following changes occurs in half revolution?
a) kinetic energy changes by $\frac{mv^2}{2}$ b) kinetic energy changes by mv^2
c) momentum changes by $2mv$ d) momentum does not changes

17) The time taken to move from mean position to half of amplitude in SHM is:
a) $\frac{T}{6}$ b) $\frac{T}{12}$
c) $\frac{T}{3}$ d) $\frac{T}{9}$

18) An excess electron is on a spherical body of area $2\ mm^2$. The surface charge density is:
a) 4×10^{-12} b) 8×10^{-12}
c) 4×10^{-14} d) 8×10^{-14}

19) An electric dipole is kept in a uniform electric field. It experiences:
a) a force and a torque b) a torque but no force
c) a force but not torque d) neither force nor torque

20) The phenomenon only associated with transverse wave is:
a) reflection b) refraction
c) polarization d) interference

21) "Water proofing" agent changes the angle of contact from:
a) obtuse to acute angle b) acute to obtuse angle
c) obtuse to 90˚ d) acute to 90˚

22) A coil with its horizontal axis is perpendicular to the magnetic field. The angle between magnetic field and the plane of coil when induced emf is maximum is:
a) 90˚ b) 45˚ c) 30˚ d) 0˚

23) A girl presses her physics text book against a rough vertical wall with her hand. The direction of frictional force on the book exerted by the wall is:
a) downwards b) upwards
c) out from the wall d) into the wall

24) A PN junction diode can be used as:
a) rectifier b) capacitor
c) inductor d) impedance

25) A lens behaves as a converging lens in air and diverging lens in water. The refractive index of material of lens is:
a) equal to air b) equal to water
c) more than air and less than water d) more than water

26) The velocity of photo electrons emitted in photoelectric effect depends on:
a) wavelength of incident light b) intensity of incident light
c) photoelectric current d) both b and c

27) Which of the following is the correct order of size of the given species?
a) $I > I^- > I^+$ b) $I^+ > I^- > I$ c) $I > I^+ > I^-$ d) $I^- > I > I^+$

28) An alkyl halide is heated with Ag_2O. It produces:
a) ester b) ether c) ketone d) alcohol

29) Which of the following hydrogen bonds is the strongest?
a) $F - H \ldots F$ b) $O - H \ldots O$
c) $O - H \ldots F$ d) $O - H \ldots N$

30) Which of the following has highest p^H value?
a) CH_3COOK b) Na_2CO_3 c) NH_4Cl d) $NaNO_3$

31) Which of the following has least boiling point?
a) n-hexane b) n-pentane
c) 2-methyl butane d) 2,2-dimethyl propane

32) Calgon is:
a) $Na_2Al_2Si_2O_8.xH_2O$ b) $Na_2[Na_4(PO_3)_6]$
c) Na_3PO_4 d) $Ca_2Al_2Si_2O_8.xH_2O$

33) Oxidation number of P in PO_4^{3-} ion is:
a) -3 b) +7 c) +5 d) +3

34) Solvay process is used for the manufacture of:
a) NaOH b) Na_2CO_3 c) NH_3 d) NaCl

35) Purest form of iron is:
a) pig iron b) last iron c) steel d) wrought iron

36) The normality of 0.3 M phosphorous acid (H_3PO_3) is:
a) 0.1 b) 0.9 c) 0.3 d) 0.6

37) 1 atom of an element weighs 1.8×10^{-22} g. The atomic weight of the element is:
a) 29.9 b) 18 c) 108 d) 154

38) Diamond is a _____.
a) metallic crystal b) covalent crystal
c) ionic crystal d) molecular crystal

39) A process is spontaneous at all temperature if:
a) $\Delta H < 0, \Delta S < 0$ b) $\Delta H < 0, \Delta S > 0$
c) $\Delta H = 0, \Delta S < 0$ d) $\Delta H > 0, \Delta S < 0$

40) In the following reaction, the product formed is:
$CH_3COCl \xrightarrow{H_2/Pd,BaSO_4}$
a) Acetaldehyde b) Acetone
c) Acetic acid d) Acetic anhydride

41) If $2\sin 2x = \sin x$, then general values of x are given by:
a) $2n\pi$ b) $\frac{n\pi}{3}$ c) $n\pi$ d) $n\pi + \frac{\pi}{2}$

42) The range of the function $f(x) = |x - 1|$ is:
a) $(-\infty, 0)$ b) $[0, \infty)$ c) R d) $R - \{1\}$

43) The least integer k which makes the roots of the equation $x^2 + 5x + k = 0$ imaginary is:
a) 4 b) 5 c) 6 d) 7

44) $\lim_{x \to \frac{\pi}{4}} \frac{(1+\tan x)}{\cos 2x} =$
a) 1/2 b) 1 c) -1 d) 0

45) If $f(x) = |\cos x|$, then $f'\left(\frac{3\pi}{4}\right) =$
a) -1/2 b) $\frac{\sqrt{3}}{2}$ c) -1 d) $\frac{1}{\sqrt{2}}$

46) $\int \frac{e^{\tan^{-1} x}}{(1+x^2)} dx =$
a) $e^{\tan^{-1} x} + c$ b) $e^{-\tan^{-1} x} + c$
c) $\frac{e^{\tan^{-1} x}}{2} + c$ d) $e^{\tan x} + c$

47) If $\vec{a} = \left(2\vec{i} + \vec{j} + \vec{k}\right)$ and $\vec{b} = \left(5\vec{i} - 3\vec{j} + 2\vec{k}\right)$, then the projection of $\vec{b}$ upon $\vec{a}$ is:
a) 3 b) 4 c) 5 d) 6

48) $\sim[(\sim p) \vee q]$ is equal to:
a) $\sim p \vee q$ b) $p \vee \sim q$ c) $\sim p \vee \sim p$ d) $\sim p \wedge \sim q$

49) The distance of P(x, y, z) from xy-plane is:
a) x b) y c) z-y d) |z|

50) The probability of getting the sum as a prime number if two dice are thrown is:
a) 5/24 b) 5/12 c) 5/30 d) 1/4

51) $A - B =$
a) $(A \cup B) - (A \cap B)$ b) $A \cap BC$
c) $A \cap B$ d) $B - A$

52) The 19th term of the progression 2, 6, 10, ……, 86 from end is:
a) 10 b) 14 c) 18 d) 6

53) If $Ar(z) = \theta$, then $Arg(\bar{z}) =$
a) θ b) $-\theta$ c) $\pi - \theta$ d) $\theta - \pi$

54) The homogenous equation $ax^2 + 2hxy + by^2 = 0$ represents real and coincident lines, if:
a) $h^2 = ab$ b) $h^2 < ab$ c) $h^2 > ab$ d) $h^2 = ab$

55) The number of 5 digit numbers that can be formed without any restrictions is:
a) 990,000 b) $9 \times 4!$ c) 100,000 d) 90,000

56) If v is the variance and σ is the standard deviation, then:
a) $v^2 = \sigma$ b) $v = \sigma^2$ c) $v = \frac{1}{\sigma}$ d) $v = \frac{1}{\sigma^2}$

57) If $f(2) = 4, f'(2) = 4$, then $\lim_{x \to 2} \frac{xf(2) - 2f(x)}{x - 2} =$
a) -2 b) -4 c) 2 d) 3

58) Let the $f: R \to R$ be defined by $f(x) = 2x + \cos x$, then f:
a) has a maximum, at $x = 0$ b) has a minimum, at $x = \pi$
c) is a decreasing function d) is an increasing function

59) The equation $(k - 3)x + (k - 4)y = k - 6$ represents line parallel to x-axis, then $k =$
a) 3 b) 4 c) 6 d) 0

60) The sum of distances of any point on ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ from foci:
a) 25 b) 16 c) 10 d) 8

SECTION – B (2 marks) (2*40=80)

Read the following passage and answer the questions given below (61-64):
John had never thought much about the origin of wealth or inequalities in life. It was his firm belief that if this world was not good, the next would be good and this faith sustained him. He was not like some others whom he knew, who would sell their souls to the devil.
He always thought of God before doing anything. He lived the life of an honest man. He had not married, but did not desire another man's wife. He believed that women weakened men as was described in the story of Samson and Delilah.

61) "To sell one's soul to the devil" means:
a) suppressing one's conscience
b) giving up goodness in exchange for evil
c) giving up one's honesty for the sake of monetary benefits
d) to sell oneself to earn livelihood

62) John thought that women weakened men because:
a) he thought that women were evil
b) he believed that a woman was a fancy devi
c) he thought that a woman would spoil his life
d) he was convinced that what the story of Samson and Delilah illustrates is correct

63) It was John's belief that:
a) one can be happy only by remaining a bachelor
b) the world is a happy place
c) there is no other world
d) one must lead an honest life

64) By not desiring another man's wife John showed that:
a) he wanted to get married b) he was a man of principles
c) he felt sorry for other men d) he had no desire for another's wealth

65) An element (X) which occurs in the second period has an outer electronic configuration s^2p^1, what is the formula and nature of its oxide?
a) XO_3, basic b) X_2O_3, basic
c) XO_3, acidic d) X_2O_3, acidic

66) The solubility product of a salt having general formula MX_2 in water is 4×10^{-12}. The concentration of M^{2+} ions in the aqueous solution of the salt is:
a) 2×10^{-6} M b) 1×10^{-4} M
c) 1.6×10^{-4} M d) 4×10^{-10} M

67) If ${E^0}_{Fe^{2+}/Fe} = -0.441$ V and ${E^0}_{Fe^{3+}/Fe^{2+}} = 0.771$ V, the standard emf of the reaction $Fe + 2Fe^{3+} \longrightarrow 3Fe^{2+}$ will be:
a) 1.653 V b) 1.212 V c) 0.330 V d) 0.111 V

68) In the following reaction, $CaC_2 \xrightarrow{H_2O} P \xrightarrow{hot\ iron\ tube} Q \xrightarrow{CH_3Cl,AlCl_3} R$, the product 'R' is:
a) benzene b) ethyl benzene
c) toluene d) n-propyl benzene

69) 2 g of metal carbonate is neutralized completely by 100 mL of 0.1 N HCl. The equivalent weight of metal carbonate is:
a) 50 b) 100 c) 150 d) 200

70) For a first order reaction $A \rightarrow B$, the reaction rate at reactant concentration of 0.01 M is found to be 2.0×10^{-5} molL^{-1}s^{-1}. The half-life of the reaction is:
a) 300 s b 30 s c) 220 s d) 347 s

71) MnO_2 reacts with a halogen acid to give greenish yellow glass. When excess of this gas reacts with NH_3, an unstable trihalide is formed. In this process, the oxidation state of nitrogen changes from:
a) -3 to +3 b) -3 to 0 c) -3 to +5 d) 0 to -3

72) An organic compound A on reduction gives compound B. B on treatment with $CHCl_3$ and alcoholic KOH gives C. C on catalytic reduction gives N-methylaniline. The compound A is:
a) Methylamine b) Nitromethane c) Aniline d) Nitrobenzene

73) At a given instant, there are 25% undecayed radioactive nuclei in a sample. After 10 seconds, the number of undecayed nuclei reduces to 12.5%, then the mean life of the nuclei is:
a) 10.21 s b) 14.43 s c) 5.31 s d) 7.43 s

74) The wavelength of radiation emitted is λ_0 when an electron jumps from the third to second orbit of hydrogen atom. For the electron jumping from the fourth to the second orbit of the hydrogen atom, the wavelength of radiation emitted will be:
a) $(16/25)\lambda_0$ b) $(20/27)\lambda_0$ c) $(27/20)\lambda_0$ d) $(25/16)\lambda_0$

75) When the angle of incidence is 60˚ on the surface of a glass slab, it is found that the reflected ray is completely polarized. The velocity of light in glass is:
a) $\sqrt{2} \times 10^8$ m/s b) $\sqrt{3} \times 10^8$ m/s c) 2×10^8 m/s d) 3×10^8 m/s

76) A monochromatic light is incident at a certain angle on an equilateral triangular prism and suffers minimum deviation. If the refractive index of the material of the prism is $\sqrt{3}$, then the angle of incidence is:
a) 60˚ b) 45˚ c) 90˚ d) 30˚

77) A circular coil of 25 turns and radius of 12 cm is placed in a uniform magnetic field of 0.5 T normal to the plane of coil. If the current in the coil is 5 A, then the total torque experienced by the coil is:
a) 1.5 Nm b) 2.5 Nm c) 3.5 Nm d) zero

78) The battery of a trunk has an emf of 24 V. If the internal resistance of the battery is 0.8 Ω, the maximum current that can be drawn from the battery is:
a) 30 A b) 32 A c) 33 A d) 34 A

79) Consider a thin spherical shell of radius R consisting of uniform surface charge density σ. The electric field at a point outside the shell at a distance x from its centre is:
a) inversely proportional to σ b) directly proportional to x^2
c) directly proportional to R d) inversely proportional to x^2

80) A train standing at the outer signal of a railway station blows a whistle of frequency 400 Hz in still air. The train begins to move with a speed of 30 m/s towards the platform. The frequency of the sound heard by an observer standing on the platform is (speed of sound in air = 330 m/s):
a) 420 Hz b) 430 Hz c) 440 Hz d) 450 Hz

81) The temperature of 'n' moles of an ideal gas is increased from T to 4T through a process for which pressure $P = aT^{-1}$, where 'a' is a constant. Then, the work done by the gas is:
a) nRT b) $4nRT$ c) $2nRT$ d) $6nRT$

82) A steel wire can support a maximum load of W before reaching its elastic limit. How much load another wire, made out of identical steel, but with a radius one half the radius of the first wire, support before reaching its elastic limit?
a) W b) W/2 c) W/4 d) 4W

83) When a solid sphere rolls without slipping down an inclined plane making an angle θ with the horizontal, the acceleration at its centre of mass is a. If the same sphere slides without friction, its acceleration a' will be:
a) $\frac{7}{2}a$ b) $\frac{5}{7}a$ c) $\frac{7}{5}a$ d) $\frac{5}{2}a$

84) A shell is fired from a fixed artillery gun with an initial speed u such that it hits the target on the ground at a distance R from it. If t_1 and t_2 are the values of the time taken by it to hit the target in two possible ways, the product t_1t_2 is:
a) R/g b) R/4g c) R/2g d) 2R/g

85) What mass of ice at 0˚C is required to cool 300 g of water from 50˚C to 0˚C?
a) 150 g b) 125 g c) 187.5 g d) 75 g

86) If A_1, A_2, A_3 be the areas of ex-circles and A be the area of in-circle of a triangle, then the value of $\frac{1}{\sqrt{A_1}} + \frac{1}{\sqrt{A_2}} + \frac{1}{\sqrt{A_3}}$ is:
a) $\frac{1}{\sqrt{A_1A_2A_3}}$ b) $\frac{1}{\sqrt{\pi {r_1}^2}}$ c) $\sqrt{A}$ d) $\frac{1}{\sqrt{A}}$

87) If a, b, c are in G.P., then $log_a m, log_b m, log_c m$ are in:
a) A.P. b) G.P. c) H.P. d) both A.P. and H.P.

88) The probability that in the toss of two dice, we obtain the sum 7 or 11 is:
a) 1/6 b) 1/18 c) 2/9 d) 3/4

89) The coefficient of x^{50} in the expansion of $(1+x)^{50}(1-x+x^2)^{50} =$
a) ${}^{50}C_5$ b) ${}^{50}C_{10}$ c) ${}^{50}C_{29}$ d) ${}^{50}C_{30}$

90) The length of the common chord of the circles $x^2 + y^2 = 12$ and $x^2 + y^2 - 4x + 3y - 2 = 0$ is:
a) $4\sqrt{2}$ b) 4 c) 8 d) $16\sqrt{3}$

91) The general solutions of the differential equation $log_e\left(\frac{dy}{dx}\right) = (x + y)$ is:
a) $e^x + e^y = c$ b) $e^x + e^{-y} = c$ c) $e^{-x} + e^y = c$ d) $e^{-x} + e^{-y} = c$

92) If $y = a\sin mx + b\cos mx$, then $\frac{d^2y}{dx^2} =$
a) $-m^2y$ b) m^2y c) $-my$ d) my

93) The area bounded by the curve $y = |x|, |x| = 1$ and $y = 0$ is:
a) 2 sq. units b) 1/2 sq. units c) 1 sq. units d) 4 sq. units

94) If $\vec{a}$ and $\vec{b}$ are unit vectors such that $|\vec{a}+\vec{b}|=1$, then the value of $|\vec{a}-\vec{b}|=$

a) 1 b) 2 c) 3 d) $\sqrt{3}$

95) The value of p for the equations $4x^2+px-12=0$ and $4x^2+3px-4=0$ to have a common root is:

a) $p=\pm 3$ b) $p=\pm 2$ c) $p=1$ d) $p=4$

96) The equation $\frac{x^2}{2-r}+\frac{y^2}{r-5}+1=0$ represents an ellipse of:

a) $r>2$ b) $2<r<5$ c) $r=2$ or $r=5$ d) $2<r\leq 5$

97) The S.D. of 5 scores 1, 2, 3, 4, 5 is:

a) $\frac{2}{5}$ b) $\frac{3}{5}$ c) $\sqrt{2}$ d) $\sqrt{3}$

98) Let the function $f: R \to R$ defined by

$$f(x)=\begin{cases}(3x-1) \text{ if } x>3\\ (x^2-2) \text{ if } -2<x<3\\ (2x+3) \text{ if } x<-2\end{cases}$$

Then $f(-1)$ is equal to:

a) $f(-3)$ b) $2f(-3)$ c) $\frac{1}{2}f(-3)$ d) $\frac{1}{3}f(-3)$

99) The value of $\frac{1}{(n+1)}+\frac{1}{2(n+1)^2}+\frac{1}{3(n+1)^3}+\cdots+\infty=$

a) $\log(n+1)$ b) $\frac{1}{n}-\frac{1}{2n^2}+\frac{1}{3n^3}-\cdots+\infty$

c) $2\log(n-1)$ d) $\log\left(\frac{n}{n-1}\right)$

100) $\int_0^{\pi/4}\frac{1}{1+\sin x}dx=$

a) $\frac{\pi}{4}$ b) $\frac{1}{\sqrt{2}}$ c) $2-\sqrt{2}$ d) $1+\frac{1}{\sqrt{2}}$

❖❖❖❖ Thank You!!! ❖❖❖❖