**ZEAL EDUCATION SOCITY's**

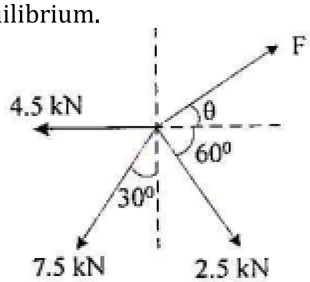
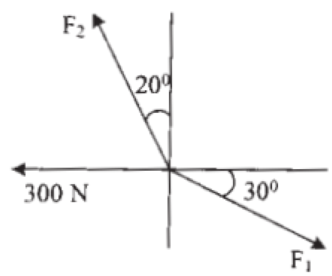
**ZEAL COLLEGE OF ENGINEERING AND RESEARCH,**

**NARHE │PUNE -41 │ INDIA**

**DEPARTMENT OF ENGINEERING SCIENCES**

# Unit wise Question Bank

**Subject: EM** **Unit No. 3: Equilibrium** **Class: F.E.**

| Que . No | Question Statement | Que. No | Question Statement |
|---|---|---|---|
| **SHORT ANSWER QUETIONS** | | | |
| 1 | State and explain active forces, reactive forces and free body diagram with suitable example. | | |
| 2 | State and explain Two Force and Three Force Principle for equilibrium with sketches. | | |
| 3 | State and Explain Lami's Theorem with net sketch. | | |
| 4 | Explain types of loads acting on the beams | | |
| 5 | Explain types of Beams with neat sketches | | |
| 6 | Explain types of supports and their Reactions with neat sketches | | |
| 7 | Differentiate between statically determinate and statically indeterminate beams. | | |
| 8 | Write Conditions of Equilibrium for Co-planer Concurrent Force System | | |
| 9 | Write Conditions of Equilibrium for Co-planer Non-Concurrent Force System | | |
| 10 | Write Conditions of Equilibrium Concurrent Space Force System | | |
| 11 | Write Conditions of Equilibrium for Parallel Space Force System | | |
| 12 | Write Conditions of Equilibrium Non-Concurrent Space Force System | | |
| 13 | Determine the magnitude and position of force F so that the force system shown in Fig. maintain equilibrium.<br><br> | 14 | Determine the magnitude of $F_1$ and $F_2$ so that the particle is in equilibrium. Refer Fig.<br><br> |

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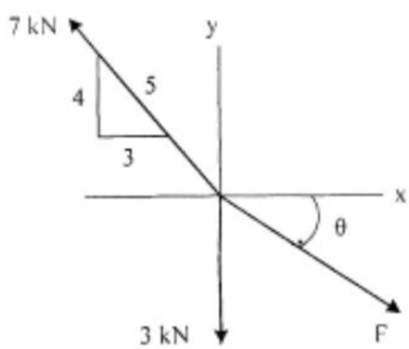
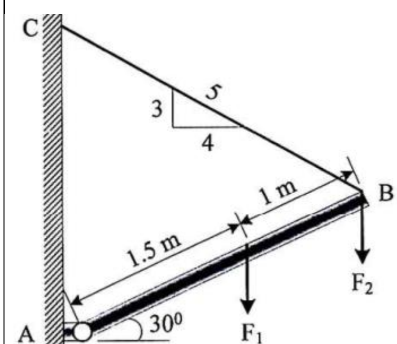
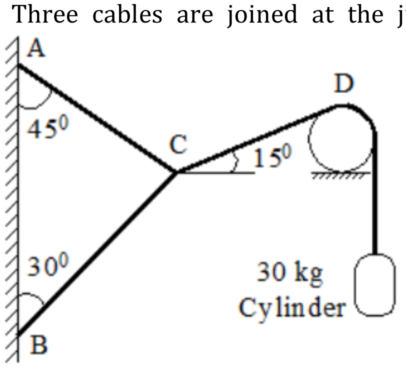
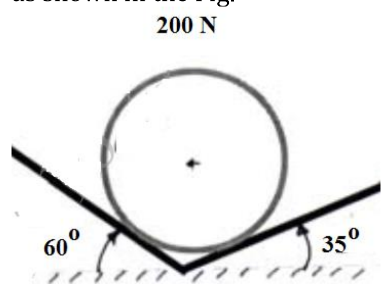
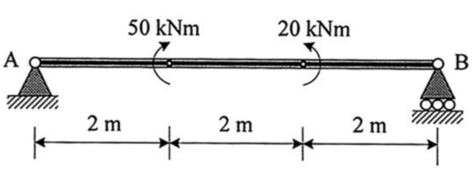
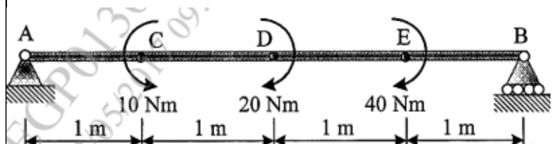
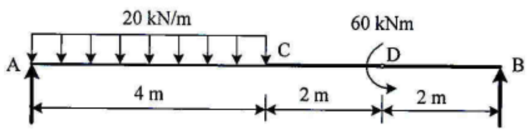
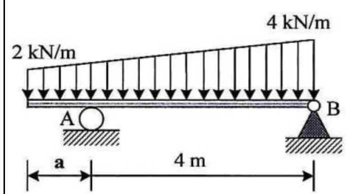
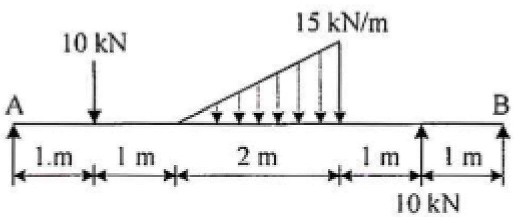
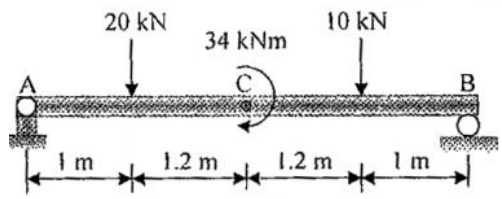
<table>
<tr><th>Que. No</th><th>Question Statement</th><th>Que. No</th><th>Question Statement</th></tr>
<tr><td>15</td><td>Determine the magnitude and direction θ of force F so that the particle is in equilibrium. Refer Fig.<br>

</td><td>16</td><td>The boom is intended to support two vertical loads, $F_1$ and $F_2$ as shown in Fig. if the cable CB can sustain a maximum load of 1500 N before it fails, determine the critical loads $F_1$ and $F_2$ if $F_1 = 2F_2$. Also determine the reaction at A.<br>

</td></tr>
<tr><td>17</td><td>Three cables are joined at the junction C as shown in Fig. Determine the tension in cable AC and BC caused by the weight of the 30 kg cylinder.<br>

</td><td>18</td><td>Determine the reactions at all the point of contacts for a sphere of 200 N kept in a trough as shown in the Fig.<br>

</td></tr>
<tr><td colspan="4">BEAM & SUPPORT REACTIONS</td></tr>
<tr><td>19</td><td>Determine reaction at A and B for the beam loaded and supported as shown in Fig.<br>

</td><td>20</td><td>Determine reaction at A and B for the beam loaded and supported as shown in Fig. Moments are acting at point C, D and E.<br>

</td></tr>
</table>

## Unit wise Question Bank

**Subject: EM** **Unit No. 3: Equilibrium** **Class: F.E.**

<table>
<tr><th>Que. No</th><th>Question Statement</th><th>Que. No</th><th>Question Statement</th></tr>
<tr><td>21</td><td>Determine reaction at for the beam loaded and supported as shown in Fig.

</td><td>22</td><td>A simply supported beam loaded and supported is as shown in Fig. If the reactions at supports are equal in magnitude, determine the overhang 'a'.

</td></tr>
<tr><td>23</td><td>A simply supported beam AB of span 6 m is loaded and supported as shown in Fig. Find the reactions at support A and B.

</td><td>24</td><td>Determine the support reaction of the beam loaded and supported as shown in Fig.

</td></tr>
</table>

**Multiple Choice Questions**

**Q. 1** An isolated body separated from all contact surfaces on which active and reactive forces are drawn called as……………..

(a) Rigid body (b) Particle (c) Free body diagram (d) none of these

**Q. 2** An isolated body separated from all contact surfaces on which active and reactive forces are drawn called as……………..

(a) Rigid body (b) Particle (c) deformable body (d) none of these

**Q. 3** If the resultant of the force system acting on the body is zero then that body is in…………

(a) Static equilibrium b) Dynamic equilibrium (c) Both a and b (d) none of these

**Q. 4** If the resultant of the force system acting on the body is zero then that body is in…………

(a) Static equilibrium b) Dynamic equilibrium (c) motion (d) none of these

**Q. 5** If the resultant of the force system acting on the body is not zero then that body is in…………

(a) Static equilibrium b) Dynamic equilibrium (c) motion (d) none of these

**Q. 6** If the resultant of the force system acting on the body is not zero then that body is in…………

(a) Static equilibrium b) Dynamic equilibrium (c) Both a and b (d) none of these

**Q. 7** If coplaner concurrent force system is in equilibrium then following conditions are used

(a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Mz = 0$,

(d) none of these

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**Subject: EM** **Unit No. 3: Equilibrium** **Class: F.E.**

| Que. No | Question Statement | Que. No | Question Statement |
|---|---|---|---|
| **Q. 8** | If coplaner concurrent force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 9** | If coplaner non concurrent force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 10** | If coplaner non concurrent force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy\ 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 11** | If coplaner parallel force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fy = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 12** | If coplaner parallel force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 13** | If concurrent space force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 14** | If concurrent space force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 15** | If non concurrent space force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0, \Sigma Mx = 0, \Sigma My = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 16** | If non concurrent space force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 17** | If parallel space force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Fx = 0, \Sigma My = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 18** | If parallel space force system is in equilibrium then following conditions are used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) $\Sigma Fx = 0, \Sigma Fy = 0, \Sigma Fz = 0$ (c) $\Sigma Mx = 0, \Sigma My = 0, \Sigma Mz = 0$, (d) none of these | | |
| **Q. 19** | If three concurrent coplaner forces are in equilibrium then following method is used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) Lamis theorem (c) both a and b (d) none of these | | |
| **Q. 20** | If two concurrent coplaner forces are in equilibrium then following method is used (a) $\Sigma Fx = 0, \Sigma Fy = 0$ b) Lamis theorem (c) both a and b (d) none of these | | |

## Unit wise Question Bank

**Subject: EM** **Unit No. 3: Equilibrium** **Class: F.E.**

| Que . No | Question Statement | Que. No | Question Statement |
|---|---|---|---|
| Q. 21 | If more than three concurrent coplaner forces are in equilibrium then following method is used<br>(a) ΣFx = 0, ΣFy = 0 b) Lamis theorem (c) both a and b (d) none of these | | |
| Q. 22 | If three concurrent space forces are in equilibrium then following method is used<br>(a) ΣFx = 0, ΣFy = 0 b) Lamis theorem (c) both a and b (d) none of these | | |
| Q. 23 | If three concurrent space forces are in equilibrium then following method is used<br>(a) ΣFx = 0, ΣFy = 0, ΣFz = 0 b) Lamis theorem (c) both a and b (d) none of these | | |
| Q. 24 | If three parallel space forces are in equilibrium then following method is used<br>(a) ΣFx = 0, ΣFy = 0, ΣFz = 0 b) Lamis theorem (c) both a and b (d) none of these | | |
| Q. 25 | If three non concurrent space forces are in equilibrium then following method is used<br>(a) ΣFx = 0, ΣFy = 0, ΣFz = 0 b) Lamis theorem (c) both a and b (d) none of these | | |
| Q. 26 | If three non concurrent coplaner forces are in equilibrium then following method is used<br>(a) ΣFx = 0, ΣFy = 0, ΣFz = 0 b) Lamis theorem (c) both a and b (d) none of these | | |
| Q. 27 | If a block of mass m supported by plane smooth contact surface then normal reaction developed between contact surface is equal to<br>(a) mg b) N-mg (c) mgcosθ (d) none of these | | |
| Q. 28 | If a block of mass m supported by smooth contact surface inclined at an angle θ wrt horizontal then normal reaction developed between contact surface is equal to<br>(a) mg cosθ b) mg sinθ (c) both (d) none of these | | |
| Q. 29 | If a block of mass m supported by smooth contact surface inclined at an angle θ wrt horizontal then normal reaction developed between contact surface is equal to<br>(a) mg b) mg sinθ (c) both (d) none of these | | |
| Q. 30 | Smooth surface develops……….. reactions<br>(a) normal reaction b) normal and friction (c) both (d) none of these | | |
| Q. 31 | Rough surface develops……….. reactions<br>(a) normal reaction b) normal and friction (c) both (d) none of these | | |
| Q. 32 | Hinge support develops……….. reactions<br>(a) normal and transverse b) vertical (c) both (d) none of these | | |
| Q. 33 | Roller supports develops……….. reactions<br>(a) normal b) normal and friction (c) both (d) none of these | | |
| Q. 34 | Fixed support develops……….. reactions<br>(a) normal and transverse b) normal and friction (c) both (d) none of these | | |
| Q. 35 | Cable develops……….. reactions<br>(a) normal b) normal and friction (c) both (d) none of these | | |

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| Que . No | Question Statement | Que. No | Question Statement |
|---|---|---|---|
| Q. 36 | Cables develops……….. reactions<br>(a) compressive b) tensile (c) both (d) none of these | | |
| Q. 37 | If unknown reaction components are determined by using conditions of equilibrium only then these structures are called as…………<br>(a) Determinate structures b) Indeterminate structures (c) both (d) none of these | | |
| Q. 38 | If unknown reaction components are not determined by using conditions of equilibrium only then these structures are called as…………<br>(a) Determinate structures b) Indeterminate structures (c) both (d) none of these | | |
| Q. 39 | If unknown reaction components are not determined by using conditions of equilibrium only then these structures are called as…………<br>(a) Indeterminate structures b) Redundant structures (c) both (d) none of these | | |
| Q. 40 | Simply supported beam is the example of<br>(a) Determinate beam b) Indeterminate beam (c) both (d) none of these | | |
| Q. 41 | Cantilever beam is the example of<br>(a) Determinate beam b) Indeterminate beam (c) both (d) none of these | | |
| Q. 42 | Propped cantilever beam is the example of<br>(a) Determinate beam b) Indeterminate beam (c) both (d) none of these | | |
| Q. 43 | Compound beam is the example of<br>(a) Determinate beam b) Indeterminate beam (c) both (d) none of these | | |
| Q. 44 | Continuous beam is the example of<br>(a) Determinate beam b) Indeterminate beam (c) both (d) none of these | | |
| Q. 45 | Fixed beam is the example of<br>(a) Determinate beam b) Indeterminate beam (c) both (d) none of these | | |
| Q. 46 | Overhanging beam is the example of<br>(a) Determinate beam b) Indeterminate beam (c) both (d) none of these | | |
| Q. 47 | Simply supported beam is the example of<br>(a) Determinate beam b) Perfect beam (c) both (d) none of these | | |
| Q. 48 | Simply supported beam is the example of<br>(a) Indeterminate beam b) Imperfect beam (c) both (d) none of these | | |
| Q. 49 | Cantilever beam is the example of<br>(a) Determinate beam b) Perfect beam (c) both (d) none of these | | |
| Q. 50 | Cantilever beam is the example of<br>(a) Indeterminate beam b) Imperfect beam (c) both (d) none of these | | |

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**Subject: EM** **Unit No. 3: Equilibrium** **Class: F.E.**

| Que . No | Question Statement | Que. No | Question Statement |
|---|---|---|---|
| **Q. 51** | Compound beam is the example of<br>(a) Determinate beam b) Perfect beam (c) both (d) none of these | | |
| **Q. 52** | Compound beam is the example of<br>(a) Indeterminate beam b) Imperfect beam (c) both (d) none of these | | |
| **Q. 53** | Fixed beam is the example of<br>(a) Determinate beam b) Perfect beam (c) both (d) none of these | | |
| **Q. 54** | Fixed beam is the example of<br>(a) Indeterminate beam b) Imperfect beam (c) both (d) none of these | | |
| **Q. 55** | Continuous beam is the example of<br>(a) Determinate beam b) Perfect beam (c) both (d) none of these | | |
| **Q. 56** | Continuous beam is the example of<br>(a) Indeterminate beam b) Imperfect beam (c) both (d) none of these | | |
| **Q. 57** | Propped cantilever beam is the example of<br>(a) Determinate beam b) Perfect beam (c) both (d) none of these | | |
| **Q. 58** | Propped cantilever beam is the example of<br>(a) Indeterminate beam b) Imperfect beam (c) both (d) none of these | | |
| **Q. 59** | Overhanging beam is the example of<br>(a) Determinate beam b) Perfect beam (c) both (d) none of these | | |
| **Q. 60** | Overhanging beam is the example of<br>(a) Indeterminate beam b) Imperfect beam (c) both (d) none of these | | |
| **Q. 61** | Self-weight of pedestrian on beam is the example of<br>(a) Point load b) UDL (c) both (d) none of these | | |
| **Q. 62** | Self-weight of beam is the example of<br>(a) Point load b) UDL (c) both (d) none of these | | |

## Unit wise Question Bank

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| Que . No | Question Statement | Que. No | Question Statement |
|---|---|---|---|
| **Q. 63** Floor supported by four columns at the ends is the example of (a) Coplaner parallel force system b) Parallel space force system (c) both (d) none of these | | | |
| **Q. 64** Floor supported by four columns at the ends is the example of (a) Unlike parallel force system b) Parallel space force system (c) both (d) none of these | | | |
| **Q. 65** Electric pole supported by three cables is the example of (a) Coplaner concurrent force system b) Concurrent space force system (c) both (d) none of these | | | |
| **Q. 66** Beam supported by two columns at the ends is the example of (a) Coplaner parallel force system b) Parallel space force system (c) both (d) none of these | | | |
| **Q. 67** Building Floors supported by columns at the ends is the example of (a) Coplaner parallel force system b) Parallel space force system (c) both (d) none of these | | | |
| **Q. 68** A table supported by four columns at the ends is the example of (a) Coplaner parallel force system b) Parallel space force system (c) both (d) none of these | | | |
| **Q. 69** Parashot is the example of (a) Concurrent space force system b) Parallel space force system (c) both (d) none of these | | | |

## Unit wise Question Bank

**Subject: EM** **Unit No. 3: Equilibrium** **Class: F.E.**

| Que. No | Question Statement | Que. No | Question Statement |
|---|---|---|---|

**Q. 70** If the cantilever beam of span L is loaded with u.d.l. of w N/m for half of the span from free end, then the reacting moment at fixed end will be

(a) $\frac{wL^2}{8}$ (b) $\frac{wL^2}{4}$ (c) $\frac{3wL^2}{4}$ (d) $\frac{3wL^2}{8}$

**Q. 71** For a simply supported beam loaded with two equal point loads 'W' N at quarter span, the reaction at both ends will be

(a) 2W (b) $\frac{W}{2}$ (c) W (d) none of these.

**Q. 72** A simply supported beam is subjected to an anticlockwise moment at L/3 from left end of the span then reaction at right support is directed

(a) vertically upward (b) vertically downward
(c) towards right (d) towards left.

**Q. 73** A concentrated clockwise moment of magnitude 10 Nm is acting at the centre of a simply supported beam of span 2 m. The reaction at right end will be

(a) 5 N (↓) (b) 10 N (↓) (c) 5 N (↑) (d) 10 N (↑)

**Q. 74** If the self weight of the member of span 'L' hinged at one end and the other free, is w N/m then the minimum vertical force required at other end to keep the member horizontal will be

(a) w N (b) wL N (c) $\frac{2w}{L}$ N (d) $\frac{wL}{2}$ N

**Q. 75** A simply supported beam of length 6 m is acted upon by u.d./. of 3 kN/m. The reactions at A and B are

(a) 9 kN, 6 kN (b) 9 kN, 9 kN (c) 6 kN, 6 kN (d) 9 kN, 27 kN.

**Q. 76** A beam of span L is supported at the ends. The beam is supporting a uniformly varying load with zero intensity at Left support A and 2 w (kN/m) at B. The reaction at B is,

(a) $\frac{2wL}{3}$ kN ↑ (b) $\frac{wL}{3}$ kN ↑ (c) $\frac{wL^2}{3}$ kN ↑ (d) $\frac{wL^2}{10}$ kN ↑

**Q. 77** A beam of length 10 m is subjected to u. v. *l* which is varying from 3 $\frac{kN}{m}$ at A to 8 $\frac{kN}{m}$ at B. The reactions at A and B are

(a) 20 kN, 25 kN (b) 20 kN, 35 kN
(c) 31.66 kN, 23.34 kN (d) 15 kN, 24 kN

**Q. 78** A cantilever of L is fixed at A and free at B. It is subjected to u.v.l. of intensity zero at A and w N/m at B. The reactive moment at fixed support is,

(a) $\frac{wL^2}{2}$ Nm (b) $\frac{wL^2}{3}$ Nm (c) $\frac{wL^2}{4}$ Nm (d) $\frac{wL^2}{5}$ Nm

**Q. 79** A cantilever of L is fixed at A and free at B. It is subjected to u.v.l of intensity zero at A and w N/m at B. The reactive moment at fixed support is,

(a) $\frac{wL^2}{2}$ Nm (b) $\frac{wL^2}{3}$ Nm (c) $\frac{wL^2}{4}$ Nm (d) $\frac{wL^2}{5}$ Nm

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| Que. No | Question Statement | Que. No | Question Statement |
|---|---|---|---|
| **Q. 80** | A cantilever of L is fixed at A and free at B. It is subjected to u.v.l. of intensity zero at A and w N/m at B. The reactive moment at fixed support is,<br>(a) $\frac{wL^2}{2}$ Nm (b) $\frac{wL^2}{3}$ Nm (c) $\frac{wL^2}{4}$ Nm (d) $\frac{wL^2}{5}$ Nm | | |
| **Q. 81** | A cantilever of L is fixed at A and free at B. It is subjected to u.v.l. of intensity zero at A and w N/m at B. The reactive moment at fixed support is,<br>(a) $\frac{wL^2}{2}$ Nm (b) $\frac{wL^2}{3}$ Nm (c) $\frac{wL^2}{4}$ Nm (d) $\frac{wL^2}{5}$ Nm | | |

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**Subject: EM** **Unit No. 3: Equilibrium** **Class: F.E.**

| Que . No | Question Statement | Que. No | Question Statement |
|---|---|---|---|

**Q. 82** the cantilever beam of span L is loaded with u.d.l. of w N/m for half of the span from free end, then the reacting moment at fixed end will be

(a) $\frac{wL^2}{8}$ (b) $\frac{wL^2}{4}$ (c) $\frac{3wL^2}{4}$ (d) $\frac{3wL^2}{8}$

**Q. 83** For a simply supported beam loaded with two equal point loads 'W' N at quarter span, the reaction at both ends will be

(a) 2W (b) $\frac{W}{2}$ (c) 3W (d) none of these.

**Q. 84** A simply supported beam is subjected to an clockwise moment at L/3 from left end of the span then reaction at right support is directed

(a) vertically upward (b) vertically downward
(c) towards right (d) towards left.

**Q. 85** A concentrated anticlockwise moment of magnitude 10 Nm is acting at the centre of a simply supported beam of span 2 m. The reaction at right end will be

(a) 5 N (↓) (b) 10 N (↓) (c) 5 N (↑) (d) 10 N (↑)

**Q. 86** If the self weight of the member of span 'L' hinged at one end and the other free, is w N/m then the minimum vertical force required at other end to keep the member horizontal will be

(a) w N (b) wL N (c) $\frac{2w}{L}$ N (d) $\frac{wL}{2}$ N

**Q. 87** A simply supported beam of length 10 m is acted upon by u.d.*l*. of 3 kN/m. The reactions at A and B are

(a) 9 kN, 6 kN (b) 9 kN, 9 kN (c) 6 kN, 6 kN (d) 15 kN, 15 kN.

**Q. 88** A beam of span L is supported at the ends. The beam is supporting a uniformly varying load with zero intensity at Left support A and 2 w (kN/m) at B. The reaction at A is,

(a) $\frac{2wL}{3}$ kN ↑ (b) $\frac{wL}{3}$ kN ↑ (c) $\frac{wL^2}{3}$ kN ↑ (d) None of these

**Q. 89** A beam of length 12 m is subjected to u. v. *l* which is varying from 3 $\frac{kN}{m}$ at A to 8 $\frac{kN}{m}$ at B. The reactions at A and B are

(a) 20 kN, 25 kN (b) 20 kN, 35 kN
(c) 31.66 kN, 23.34 kN (d) None of these

**Q. 90** A cantilever of L is fixed at A and free at B. It is subjected to u.v.l. of intensity zero at A and w N/m at B. The verticle reaction at fixed support is,

(a) $\frac{wL^2}{2}$ Nm (b) $\frac{wL^2}{3}$ Nm (c) $\frac{wL^2}{4}$ Nm (d) None of these