2.265. $\Psi(\varphi,t) = \dfrac{-3i}{2\sqrt{5}}\psi_1(\varphi)\,e^{-\frac{iE_1t}{\hbar}} + \dfrac{3i}{2\sqrt{5}}\psi_{-1}(\varphi)\,e^{-\frac{iE_{-1}t}{\hbar}} +$

$$+\frac{i}{2\sqrt{5}}\psi_3(\varphi)\,e^{-\frac{iE_3t}{\hbar}} - \frac{i}{2\sqrt{5}}\psi_{-3}(\varphi)e^{-\frac{iE_{-3}t}{\hbar}},$$

$P(E=E_{\pm1}) = \dfrac{9}{20}$, $P(E=E_{\pm3}) = \dfrac{1}{20}$, $P(M_z=\pm\hbar) = \dfrac{9}{20}$, $P(M_z=\pm3\hbar) = = \dfrac{1}{20}$, в остальных случаях $P=0$; собственные функции $\psi_n(\varphi)$ и собственные значения E_n оператора Гамильтона определены в ответе к задаче 2.261.

2.266. 1) $u(r,\varphi) = \dfrac{u_0}{8}\left[3 + 4\left(\dfrac{r}{r_0}\right)^4\cos4\varphi + \left(\dfrac{r}{r_0}\right)^8\cos8\varphi\right]$;

2) $u(r,\varphi) = \dfrac{u_0}{2^{2n}}\left[C_{2n}^n + 2\sum\limits_{k=1}^{n} C_{2n}^{n-k}\left(\dfrac{r}{r_0}\right)^{2k}\cos2k\varphi\right]$;

3) $u(r,\varphi) = \dfrac{Ar^2(r^2-r_0^2)}{24}\sin2\varphi$;

4) $u(r,\varphi) = \dfrac{A}{4}r^2\ln\dfrac{r}{r_0}\sin2\varphi$;

5) $u(r,\varphi) = \dfrac{Ar^k(r^2-r_0^2)}{4(k+1)}\sin k\varphi$;

6) $u(r,\varphi) = \dfrac{A}{8}r^3\sin2\varphi(\cos\varphi+\sin\varphi) -$

$$-\frac{Ar_0^3}{16}\left[\frac{r}{r_0}(\cos\varphi+\sin\varphi) - \frac{r^3}{r_0^3}(\cos3\phi-\sin3\varphi)\right];$$

7) $u(r,\varphi) = AI_0(\sigma r_0) + 2A\sum\limits_{k=1}^{\infty}\left(\dfrac{r}{r_0}\right)^k I_k(\sigma r_0)\cos k\varphi$.

2.267. 1) $u(r,\varphi) = \dfrac{u_0}{8}\left[1 - 4\left(\dfrac{r_0}{r}\right)^6\cos6\varphi + \left(\dfrac{r_0}{r}\right)^{12}\cos12\varphi\right]$;

2) $u(r,\varphi) = \dfrac{u_0}{2^{2n}}\left[C_{2n}^n + 2\sum\limits_{k=1}^{n}(-1)^k C_{2n}^{n-k}\left(\dfrac{r_0}{r}\right)^{2k}\cos2k\varphi\right]$;

3) $u(r,\varphi) = \dfrac{u_0}{4}\left[3 + \left(\dfrac{r_0}{r}\right)^4\cos4\varphi\right]$;

4) $u(r,\varphi) = \dfrac{A}{4}\left(\dfrac{1}{r^2} - \dfrac{1}{r_0^2}\right) + \dfrac{A}{4r^2}\ln\dfrac{r_0}{r}\cos2\varphi$;

5) $u(r,\varphi) = \dfrac{A}{8r^2}\ln\dfrac{r_0}{r}\sin2\varphi$;

6) $u(r,\varphi) = \dfrac{A}{2r}\ln\dfrac{r_0}{r}(\sin\varphi-\cos\varphi) + \dfrac{A}{8r^3}(r_0^2-r^2)(\sin3\varphi-\cos3\varphi)$;

7) $u(r,\varphi) = \dfrac{A\sin k\varphi}{(2k-1)}r^{k-1}\left(1 - \dfrac{r_0}{r}\right)$;

8) $u(r,\varphi) = AI_0(\sigma) + 2A\sum\limits_{k=1}^{\infty}(-1)^n\left(\dfrac{r_0}{r}\right)^{2n}I_{2n}(\sigma)$.

2.268. 1) $u(r,\varphi) = \dfrac{u_0}{4}\left(r\sin\varphi + \dfrac{1}{3}\dfrac{r^3}{r_0^2}\sin3\varphi\right) + C$;

2) $u(r,\varphi) = \dfrac{Ar^3}{21}(3r-4r_0)\sin3\varphi + C$;

3) $u(r,\varphi) = \dfrac{Ar^5}{10}\left(\ln\dfrac{r}{r_0} - \dfrac{1}{5}\right)\sin5\varphi + C$;